AUTOMOTIVE INDUSTRIES
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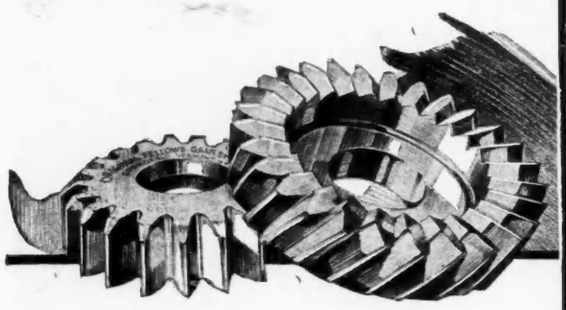

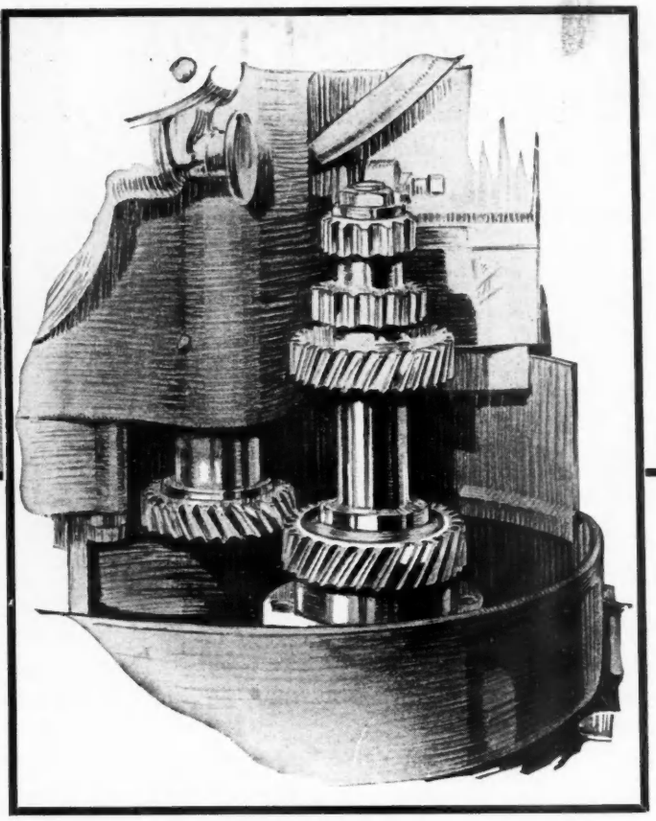

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AUTOMOTIVE INDUSTRIES

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ARE MACHINE TOOL MAKERS REALLY "AGIN" LOW RATE CHARGE-OFF?

by Joseph Geschelin

Engineering Editor, Automotive Industries

ALMOST chameleon-like changeability is expected of today's machine tools. Flexibility—adaptability to constant design changes—is the order of the day. At least that's the verdict of the speakers and discussors at the last two national meetings of the Production Activity of the S.A.E.

One reason for the emphasis on flexibility is found in the prediction by many men who ought to know, that the next five years will witness not only rapid changes in vehicle design but many of them.

From our vantage point, having seen and described a number of retooled plants recently, and knowing intimately the activity among machine tool builders, we can surely say that the equipment industry has anticipated the industry's demands for flexibility. While Alex Taub was reading his thought-provoking paper at Boston last fall, over at Plymouth they were installing a battery of two cylinder-boring machines in the new six-cylinder line described in AUTOMOTIVE INDUSTRIES recently. Not only did these machines have the much desired adjustable spindle spacing but they were among the first to utilize cemented-carbide tooling.

Our thinking changes with the times. Not so long ago, special single purpose equipment was king; more recently, the demand has shifted to flexible, unit-type machines. But, as R. E. W. Harrison, well-known machine designer, so aptly said, the progressive equipment maker always has been willing to accommodate his designs to suit any trend. Nevertheless, the single-purpose machine still is a vital factor and will continue to be wherever production volume warrants.

Now, as never before, management needs a sound, aggressive equipment policy if it is to cope successfully with the demands imposed by design changes and the clamor for lower costs. Alex Taub has led the van in seeking a better understanding between the designing engineer and factory executives. This seems to be the most practical way in which production planning can be adjusted to prospective changes in design.

At the last Annual Meeting of the S.A.E., J. E. Padgett touched very briefly on a few matters which appear to be of grave importance and deserving of more detailed inquiry. The development of new productive equipment has been so prolific despite business conditions that no one can afford to overlook its economic implications. For example, careful analysis may prove that a judicious investment in new machinery will yield better returns than the renovizing of old, obsolete equipment that must be junked just as soon as is expedient.

We were almost completely floored when Mr. Padgett said that the policy of the machine tool builder is antagonistic to the ideals of maintaining low depreciation and obsolescence charges. Surely there is some misunderstanding. If the U. S. Census figures are to be believed, there are too many machines aged ten years and over that still are doing duty at the old stand. That seems to prove that they are built to take it.

Now, as never before, management needs a sound aggressive equipment policy if it is to cope successfully with the demands imposed by design changes and the clamor for lower costs

We are inclined to think that the real difficulty lies in the usual interpretation of depreciation and obsolescence. Depreciation, in the case of well-designed and honestly built equipment, is a normal rate of wear and tear depending upon yearly mileage, assuming reasonable care. Theoretically, depreciation also includes obsolescence, but that's really another story.

About three years ago, we made a survey for AUTOMOTIVE INDUSTRIES in which it developed that production men usually figured the useful life of equipment for accounting purposes as ten years. That would amortize the investment at ten per cent per year. BUT these same men insist upon a guarantee that the new machine will pay for itself within two years—that's at the rate of 50 per cent per year. From our personal experience, we are confident that the equipment builder would be tickled pink if his machine were bought on the basis of paying for itself in five years.

In fact, a depreciation rate of 20 per cent, if accepted, probably would justify the purchase of much-needed machinery and tooling even in these hard times.

Obsolescence, on the other hand, is very dynamic and quite uncontrollable. It is almost impossible to anticipate since it is affected by improvements in the art, new invention, and style changes. A machine only a year old may become obsolescent and hence uneconomical in a competitive field although its useful life is unimpaired. This is the price of progress. Surely no one in this dynamic automotive industry would see it otherwise.

It is inevitable that in these times particularly, the question of price should come in for discussion. Unquestionably, reasonable adjustments have been made by machine tool builders in keeping with general business conditions. In fact, there are many cases where the machine tool builders have sold below cost in order to maintain their position. Obviously, this isn't good business either for the equipment makers or the industries they serve because it is only by encouraging a sound equipment industry that the automotive manufacturer will be assured of the continuance of a technical development in mechanization upon which much of the progress has depended.

A Highly Specialized Business

Before further demands are made, we should acquaint ourselves with the conditions confronting them. Let us remember that the building of machine tools is a highly specialized, usually low-volume business. It would be wonderful, indeed, if mass production methods could be applied to the making of machine tools. But it can't be done. They have to use the kind of equipment and procedure that their volume logically demands.

Where heavy masses of cast iron have been needed for rigidity as in the case of heavy duty presses, planers, large grinders, and the like, many manufacturers already have adopted welded construction. How far this will be extended naturally depends upon local conditions.

A number of people have said recently, "Let's trim weight, forget appearance, forget color and finish. That ought to cut down the price of machine tools." The answer could be, "Yes." But the "Noes" have it when it comes to a show of hands. The reason is plain. We are planning for the future and for many years the automobile plant has been a show place for the buying public. Some car builders have considered it the best advertising medium they have. So let's chalk up a part of the cost of the machine to advertising.

Another factor is the psychological effect of good-looking and well-painted equipment upon the mental attitude and productivity of the worker. Recent findings of psychologists in this field can't be laughed off.

Price Depends on Many Things

Price depends upon other things quite beyond the control of the equipment maker. Many of these factors were discussed in a series of articles published in AUTOMOTIVE INDUSTRIES early in 1931. Among these are such things as the giving of free service, the demand for demonstrators quartered without charge, free engineering on tooling for new and even old machines. At the time, we suggested a new deal. Why not bill the buyer a fair price on each service entering into the transaction. Those who need less, pay less; those who demand more, pay accordingly. Isn't that an equitable way of doing the job. It will save money for everybody in the end.

The foregoing is just a quick peep behind the scenes at some very important matters that enter into the consideration of an equipment policy. Now is a time for sound, constructive thinking and cooperative effort. In the competitive scramble for low manufacturing costs, much is to be gained by a study of new productive equipment and what it may accomplish in the current production program.

Another thing to consider is the favorable replacement cost of any of the equipment now in service. So long as certain obsolete machinery is carried on the books at a fictitious, inflated value, it will be difficult to replace, because the new equipment is penalized out of all reason "on paper." If book values were written down, and proper amortization rates applied, your shop executive would be in a better position to produce at lower cost.

Lay the cards face up and give the equipment maker an opportunity of showing how his latest products will help to improve productivity and reduce costs. But above all, look over the entire field and consider also whether the machine has the requisite flexibility demanded by the trend of engineering design.

JUST AMONG OURSELVES

Big Goings On in Old Montana

SOME new ideas about automotive taxation, registration and whatnot are popping up in Montana, it seems. One bill recently introduced would designate the warden of the State Penitentiary as the registrar of motor vehicles. Another would authorize the state to engage in production, refining and sales of gasoline and oil and would appropriate $100,000 of taxpayers money to that end. Still another proposes to license and examine all automobile mechanics at a $5 annual fee, a proposal not new to state legislatures but one quite favorable to union development and growth.

But Montana isn't the only one. A Kansas solon wants to abolish the office of motor vehicle commissioner and supplant this official with the Superintendent of the Kansas State Industrial Reformatory. And there are plenty of others. When 44 state legislatures really get into action, the automotive industry has to be prepared for anything.

Hitler Groups Cars and Planes

SINCE Adolph Hitler may eventually be to Germany what Mussolini is to Italy, his views about motor transportation must have a world-wide interest among automotive folks.

Speaking at the opening of the Berlin automobile show early in February, the then Chancellor emphasized four points as being essential to automotive prosperity. These points were: (1) the interests of motor traffic should be severed from those of other vehicular traffic on the ground that the motor car is connected with the airplane rather than with the railroad; (2) the industry should gradually be relieved from taxation; (3) an extensive program of road building should be carried out; and (4) automobile sports should be promoted.

His first point is especially interesting because, so far as we know, this particular idea has never been brought forward in this country in discussions of coordination of transportation. The suggestion that automobile sports be promoted is particularly applicable in Europe, of course, where there is still a great general interest in automotive sport events. Over here the Indianapolis Race is the only automobile sporting event that annually attracts really nation-wide attention.

No Tax on Batteries?

STORAGE batteries may not be taxable as automobile accessories, if a decision rendered by the three-judge Federal Court in Philadelphia recently is finally upheld by higher courts. The court held that, while automobiles are the largest users of storage batteries, such element in itself is not decisive of the case. The taxability depends, not on quantity used, but on whether it is primarily adapted for use in an automobile and not equally adapted to any other use.

"Unless it fulfills these two requirements it is not 'a part or single accessory' within the meaning of this statute," the court said. Two judges held this view; one dissented.

The decision if finally valid might have broad ramifications, it would seem, since there are other units on an automobile which are equally adapted to other purposes. The decision was made in a suit brought by Philadelphia Electric Storage Battery Co. to recover illegally levied taxes amounting to more than a million dollars.

Foreign Trade and Money Ban—

EUROPE has been practically dead as an export market for automobiles for several years back. Prohibitive tariffs and promises of more prohibitive ones long since convinced American builders that few cars could be shipped from the United States into the Continent.

Of late the situation has been even worse, if possible, because of the ban on removal of money from the country which now exists in a number of nations of the world, not only in Europe but elsewhere. Current restrictions, as a matter of fact, create a strong doubt as to the possibility of a parent organization in the United States being able to get hold of profits—if any—made by its subsidiaries in those countries where these restrictions exist.

And yet some export trade does continue even in the face of what seem like almost insurmountable obstacles. The obscurity of future trends in this regard is great, but we hope to find out more about probabilities before long.—N. G. S.

New German Designs Feature

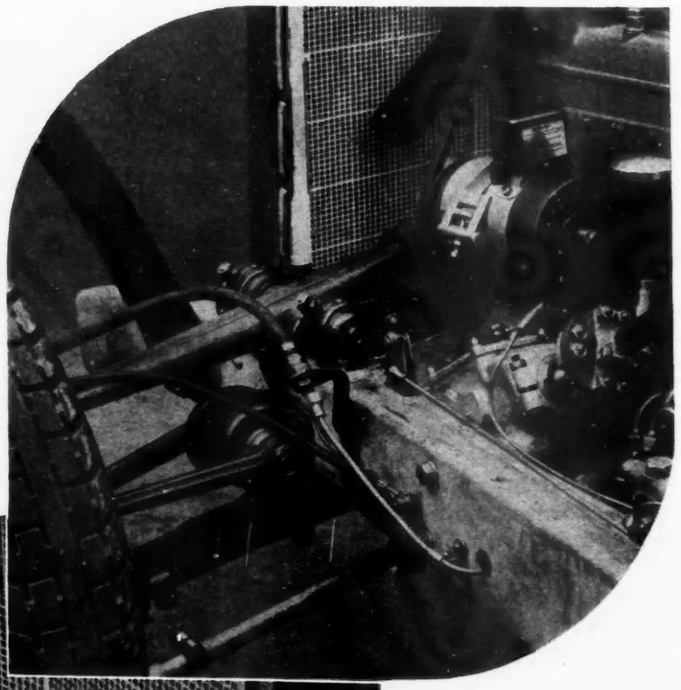
By Edwin P. A. Heinze
Berlin Correspondent, Automotive Industries

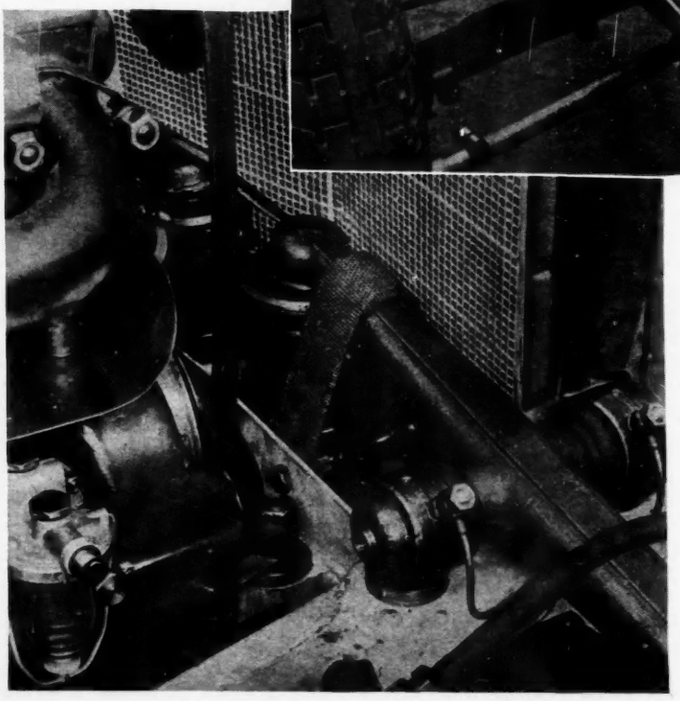
Independent Wheel Suspension, Coil Springs, Front Drive and 12-25 Cu. In. Engines, Berlin Show Reveals

THE growth of independent wheel springing and of front-wheel drive is perhaps the principal development in German automobile engineering during the past two years, as revealed by the Berlin automobile show. Owing to the adoption of soft-rubber mountings for the powerplants, and the consequent demand for stiffer frames, box-section frame channels are superceding the open channel type. Four-speed gear boxes with two or three silent speeds are now widely used, even on the cheaper models. Another important development is the rapidly growing number of 12-25-cu. in. cars, these cars being designed for minimum tax cost.

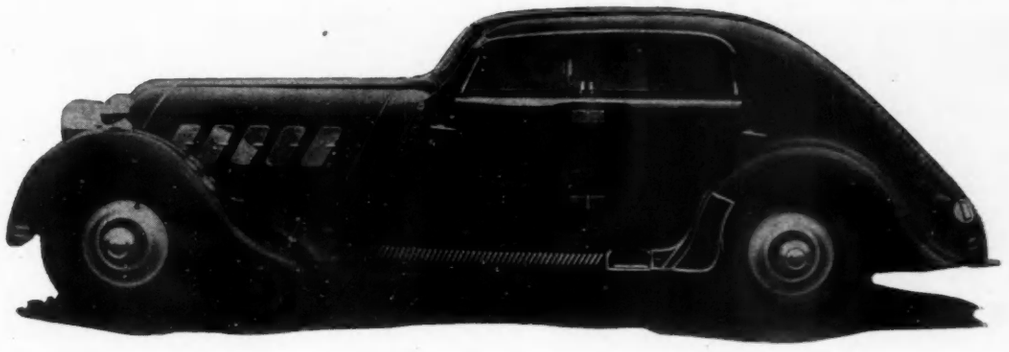
Perhaps the best way to deal with the show is to briefly describe some of the most notable exhibits. The Daimler-Benz Company, owing to its success with a 104-cu. in. Mercedes model with independent wheel suspension brought out a year ago, has become a confirmed exponent of this type of suspension. This model, it is understood, sold well both in Germany and abroad and was the means of saving the passenger-car section of the company from the difficulties experienced by so many others the past year. For 1933 the company has brought out three additional models, all embodying this type of suspension.

First there is a 122-cu. in. model which is designed on substantially the same lines as the smaller car. Then comes a 177-cu. in. model, all these three having six-cylinder engines. Rear suspension in each of these cars is by four coil springs, and each of these is provided with a supplementary spring concentric with it. The supplementary spring takes a share of the load only when the car carries four or five passengers.





These two views show the front independent suspension on the Mercedes six-cylinder 177 cu. in. car. Springing is partly by leaf and partly by coil spring and driving and braking thrusts are taken on a trunnion-mounted double-armed lever



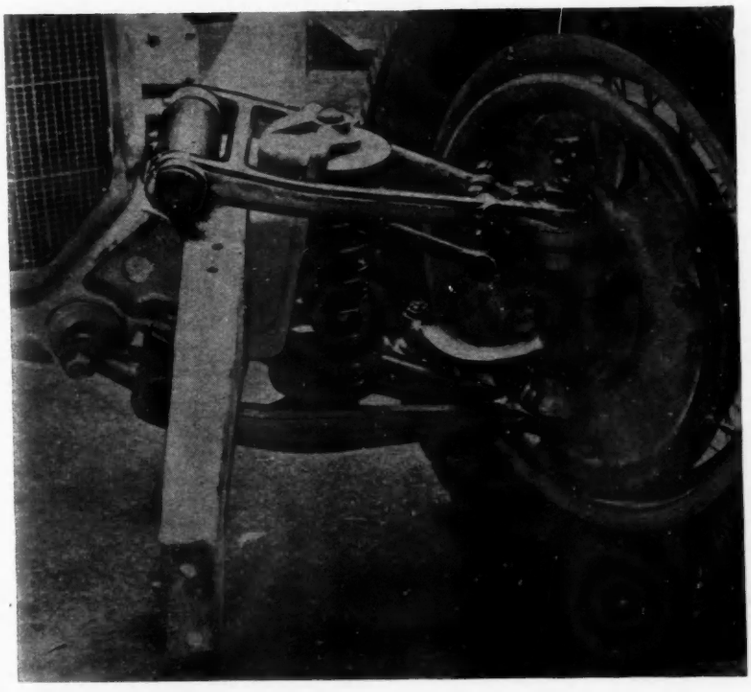
A streamline body by Georg Autenrieth, body builder, on an eight-cylinder 150 cu. in. Roehr chassis

While in the two smaller cars the steering knuckles are supported between two transverse leaf springs, one above the other, the higher speed and greater weight of the 177-cu. in. model made it seem inadvisable to rely on springs alone for taking the driving stresses and the braking torque. The lower transverse spring is retained, while the upper spring is replaced by a rocking lever having a trunnion mounting on the frame side rail. The outer ends of these levers have a spherical connection with the steering heads, while their inner ends bear down upon coiled springs located behind the radiator. All of these cars are fitted with thermostatically-controlled hydraulic shock absorbers, and all have a new type of combination air cleaner, air heater and inlet noise muffler brought out in Germany recently.

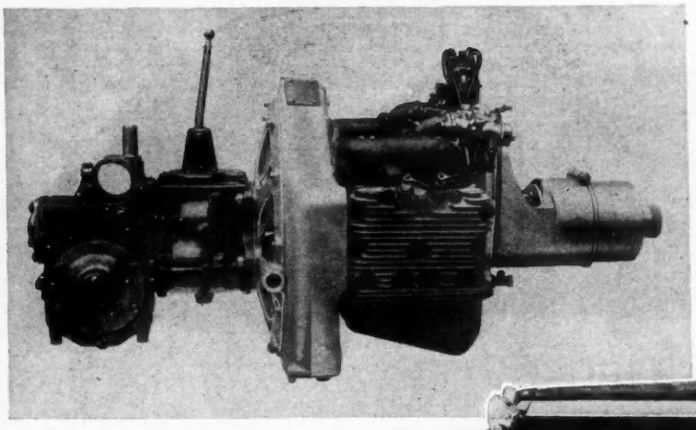
The third new Mercedes model is an example of high-class automobile engineering, being an eight-cylinder in-line supercharged model, the engine having a bore and stroke of 3.07 and 3.93 in. respectively and developing 90 hp. without and 130 hp. with the supercharger. The piston displacement is 232 cu. in., the valves are located in the cylinder head and operated by side rods, and the peaking speed is 3200 r.p.m. This car is fitted with a four-speed transmission, the fourth speed being an over-drive. Bendix automatic clutch control is built in. The oscillating rear axles are arranged in the same way as on the 177-cu. in. model, the differential being rubber mounted on the frame. The axle housings are connected to the differential housing by trunnions and take both the propelling force and the braking torque.

This model also has a novel front-wheel suspension, each front wheel taking its load through a single coil spring. This might be regarded as daring were it not for the excellent results the company has had with coiled springs in the past. Mercedes engineers favor this type of suspension for several reasons. There being no interleaf friction, these springs are more sensitive to light shocks; besides, the springs are cheaper to produce and are more immune from abuse by the owner. The steering knuckles are supported by two "wishbone-type" links pivoted to a cross-frame member above and below the side rail respectively. Secured to the side rail inside of the wishbones is a strong bracket, between which and the lower wishbone is arranged a strong coiled spring. Inside of the spring there is a stud which limits the upward swing of the system, and in the event of breakage of a spring, this stud presses against a rubber pad on the lower "wishbone," thus limiting the drop of the frame. The ends of the two wishbones have spherical joints with the steering knuckle, but while the upper one is so arranged that its end can move only in a transverse vertical plane, the lower one in addition has a slight fore and aft movement. The horizontal trunnion around which the lower wishbone swings is mounted on a vertical pivot on the frame, and two arms extending inward from this vertical trunnion embrace the frame cross-member which carries the radiator. This cross-member has an aperture in it through which extends a bolt connecting the two arms. These arms are provided with discs, and between these discs and the cross-member there are rubber washers permitting of a slight motion.

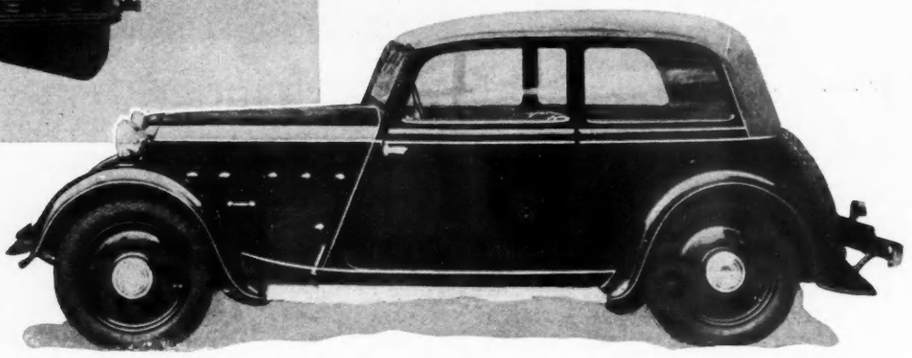
A new car on more conventional lines has been developed by the Horch Company, now part of the Auto-Union, which also includes Audi, D.K.W. and the automobile department of the Wanderer



Independent front-wheel suspension by means of coil spring on Mercedes eight-cylinder supercharged car of 130 hp.



N. A. G.-Voran powerplant and front-drive unit



The frameless N. A. G.-Voran front-drive car with four-cylinder horizontal air-cooled engine. Rear axle and front-drive unit are mounted on the wooden body

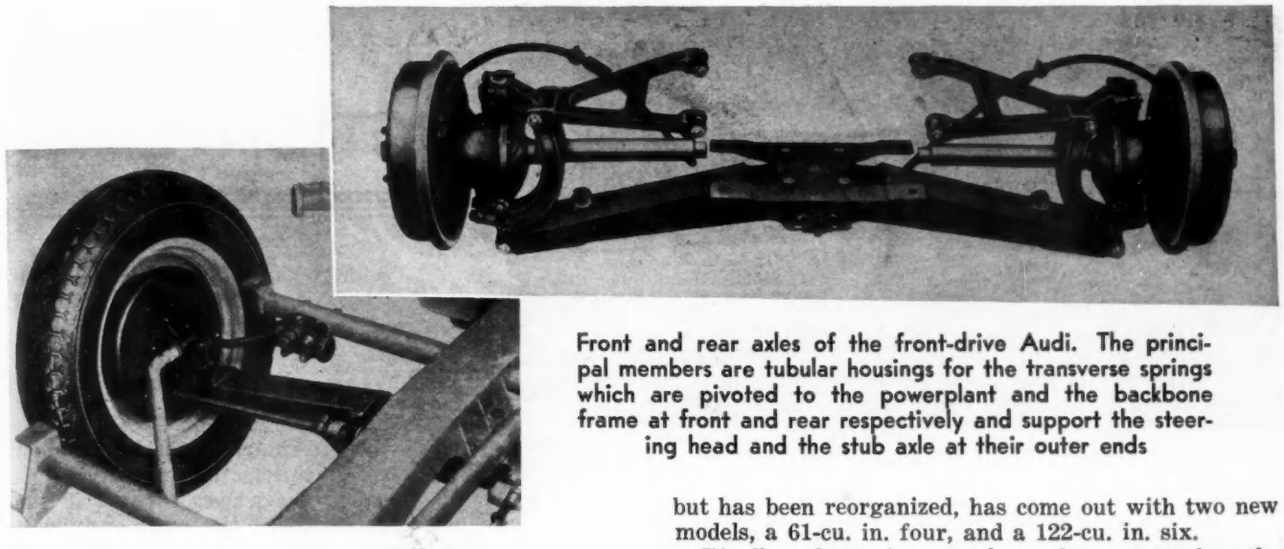
Works. This car has an eight-cylinder, 60-deg. V engine with a floating mounting. The Wanderer Company now concentrates on two models with oscillating axles which are practically alike except for the fact that the six-cylinder engines are furnished in two different bores, giving displacements of 104 and 122 cu. in. respectively.

The Audi program has been radically changed. All old models have been discontinued and a single new model of up-to-date design brought out. This is a front-driven car and was given very severe trials in the snow-bound Alps before being put in production, in order to refute the claim that front-driven cars are poor hill climbers. Front drive has made considerable headway in Germany, cars with this drive now on the German market including two D.K.W. small cars with two-stroke engines, the Adler "Trumpf" with 92-cu. in. four-stroke engine, a Stoewer with an engine of about the same displacement, the N.A.G.-Voran and the new Audi. With the exception of the two last mentioned, these various models have been on the market for a considerable time, some more than two years, and the constant spread of the front-drive principle in the face of strong opposition would indicate that it has some strong points in its favor. It should be pointed out, however, that this form of drive is used exclusively in combination with oscillating axles.

The Audi is equipped with a new 122-cu. in. Wanderer engine, to which is blocked a four-speed Prometheus front-drive unit with final drive by worm gear. The car has a central backbone frame of welded square section, which is forked at the forward end to form a cradle for the engine block. The steering knuckle with double universal joint is pivoted to a yoke, the top of which is connected by a wishbone-type link to the top of the frame rail, while the bottom is pivoted to the end of what is essentially a metal spring cover which in turn is pivoted to the center of the frame front cross-member. The spring cover contains the transverse leaf spring and is filled with grease. While the front wheels are thus guided by the wishbone, the rear wheels, which are merely trailing wheels, are supported each by a single pivoted tubular link containing the rear transverse spring.

The N.A.G. Company, handicapped by financial difficulties, was unable to bring out in time for the show the big front-drive car it has had under development, but presented a small front-drive car with four-cylinder opposed horizontal air-cooled engine of 2.75-in. bore and 3.75-in. stroke (91 cu. in). Cooling air is supplied by a blower built into the flywheel. Otherwise the front drive is similar to that of the Audi just described. A combined starter and generator is mounted on the rear end of the engine and connected directly to the crankshaft. The car has no frame. It has a wooden body on which the independently sprung rear wheels and the front-drive unit are mounted. The steering knuckles are mounted in a yoke at the bottom of a vertical bar adapted to slide in a cylinder at the end of a transverse bar, and coil springs between the yoke and the cylinder provide the front suspen-

Goliath Pioneer with 12-cu. in. two-stroke engine, of which thousands are in use in Germany, now comes with a rumble seat



Front and rear axles of the front-drive Audi. The principal members are tubular housings for the transverse springs which are pivoted to the powerplant and the backbone frame at front and rear respectively and support the steering head and the stub axle at their outer ends

sion. The car is low-priced and with four-seater cabriolet body lists at $870.

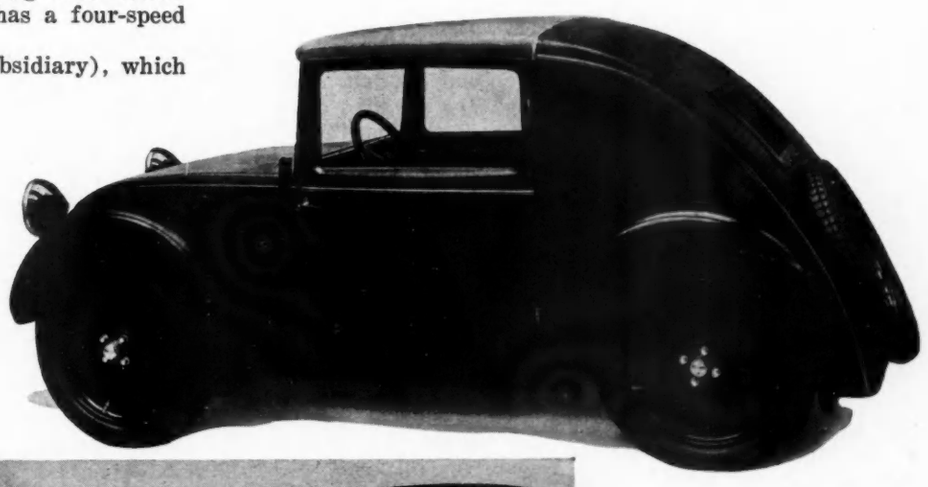
The new Roehr Company has acquired a manufacturing license from the Tatra Works of Czechoslovakia and has brought out an attractive little four-cylinder model of the same displacement as the N.A.G.-Voran just described. It has rear drive through oscillating axles. The B.M.W. has added to its four-cylinder 49-cu. in. model with tubular backbone chassis a six-cylinder 74-cu. in. model with a frame having tubular side rails, in which a rigid banjo-type rear axle is used, while independently sprung front wheels are retained. This small car has a four-speed gearbox.

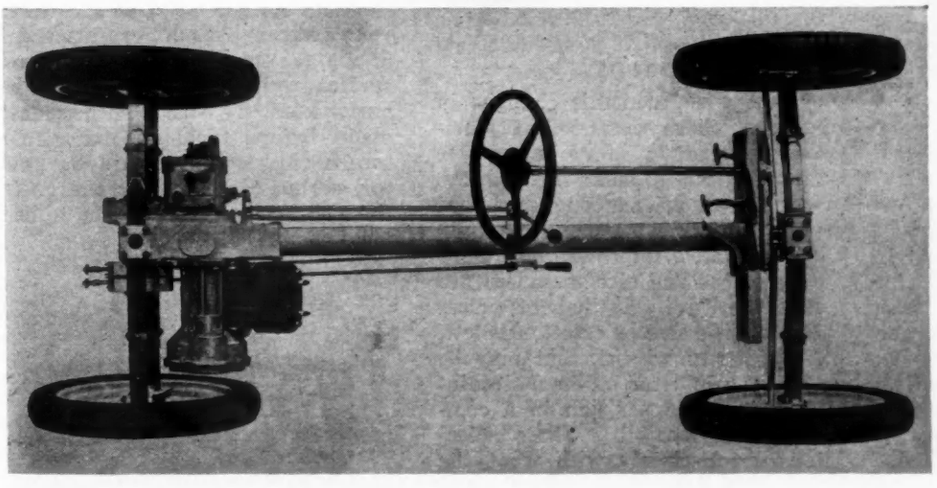
The Opel Company (G.M. subsidiary), which has been manufacturing a four-cylinder 74-cu. in. and a six-cylinder 110-cu. in. model, has added a four-cylinder 61-cu. in. model which is practically identical with the 74-cu. in. except that the stroke has been shortened and the water pump dispensed with.

Brennabor, which has been in financial difficulties but has been reorganized, has come out with two new models, a 61-cu. in. four, and a 122-cu. in. six.

Finally, a host of new cyclecars has appeared on the German market. Most of these are three-wheelers and have engines of not over 12-cu. in. displacement, which makes them tax-free in Germany. The German Government, to encourage the use of these and similar small vehicles, has adopted new regulations making it easier to obtain a driver's license applicable to cars of not over 25-cu. in displacement.

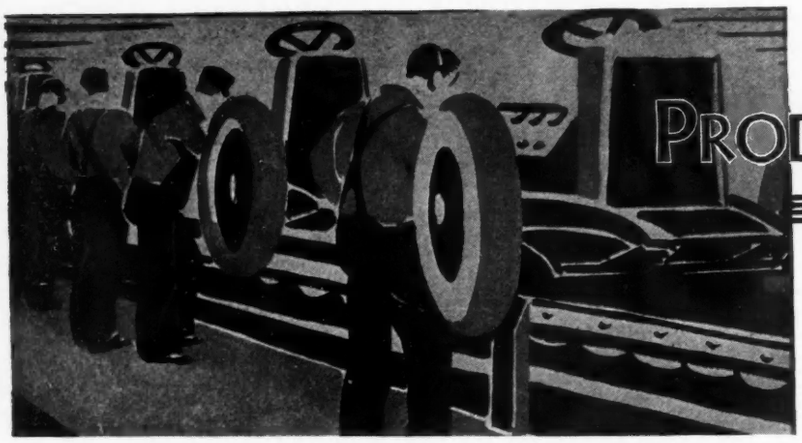
The Goliath two-seated three-wheeler, although its engine has only 12-cu. in. displacement, has become very popular in Germany. It is surprisingly quiet and is capable of maintaining a speed of 25 m.p.h.





Standard Superior "baby" car with either 25 or 31 cu. in. two-cylinder two-stroke engine

Standard superior "baby" chassis of 25 cu. in. displacement. Note tubular backbone frame, rear-mounted two-cylinder two-stroke powerplant, and independent springing



PRODUCTION LINES

Dry Plating

An interesting discussion of the possibilities of extending the scope of "mist plating" is found in the "Industrial Bulletin" for December, 1932. The technique, which is the basis of coating "Thermos" bottle interiors, is relatively simple. "A small piece of the metal with which it is desired to coat an object is placed within a small tungsten wire coil. The coil is connected with a source of current which can be used to heat it and so vaporize the metal in the coil. The object to be plated and the heating coil are enclosed in a suitable air-tight container. This apparatus is then evacuated by a vacuum pump. The metal vapors fill the chamber and condense on the exposed surfaces, covering the object and interior of the apparatus with a uniform metallic plate." The disadvantage from an industrial point of view is the requirement of an almost perfect vacuum. And is likely to be more expensive than electroplating from aqueous solutions. But it may have many special applications, particularly when a metallic coating is desired on non-metallic substances or on materials which may be injured by plating baths.

Paint as Light

The New Jersey Zinc Co., in our opinion, has made two contributions to engineering literature in their latest booklet, "Using Paint as Light." In the first place, they have taken a learned treatise on the light value of colored paints by D. L. Gamble of their laboratories, and have translated it into simple terms for quick reading by the factory engineer or any plant executive. In addition they have developed a method of approach that might be well followed by everyone faced with the need for explaining technical facts in ABC terms. Everybody concerned with the use of paint for factory interiors and with illumination for the same purpose is urged to get a copy of this booklet.

How Clean?

Buried among the problems that factory executives have to face is that of cutting fluids. Some aspects have had considerable attention, but not much has been said about the handling of the fluid in the guts of the machine. How clean should it be in view of the growing insistance upon good finish? Is it sufficient that the cutting fluid is passed through strainers? Several large manufacturers in the automotive field have installed efficient filters for the purpose. It seems that production men will have to decide how far filters must be utilized, and in fact, how much of the productive equipment may be permitted to operate without this added feature.

Mending Fences

What with economic changes in the offing there seems to be a glorious opportunity for automotive manufacturers to mend their fences. One of our friends suggests that it's a mighty wise move to equip with the latest improved machinery while prices and circumstances are what they are. Equipment prices are low; the cost of erection is low. Surely a groundwork that may be a great help later on in maintaining your price position in a competitive market. . . . These reflections check closely with what the Committee on Industrial Rehabilitation has found in their study of nation-wide conditions.

Leadership

End-of-the-year statistics show that the automotive industry led in keeping the wheels turning in the steel mills. In the usage of finished rolled steel, the automotive industry took 18.15 per cent; building trades, 16.38 per cent; containers, 10.79 per cent; while the rails went down to 9.09 per cent.

And in Alloy Steel—

the automotive industry took 77.64 per cent of the output of the steel mills. No other industry took enough to warrant mention, machine tools with 3.54 per cent to their credit being second. This continues a record of five years in which the automobile has accounted for the alloy steel consumption in these United States.

Certified Service

Certified servicing of machine tools is discussed editorially in *The Automobile Engineer* (London) for December, 1932. It seems that in England, as well as over here, there is a strong feeling that precision tools should be serviced with genuine parts supplied by the maker. Furthermore, they ask, why wouldn't it be a good idea to have your expensive machinery inspected at regular intervals by the makers' service engineer? Repairs could be anticipated, needed adjustments made before trouble occurs. Of course this service would be paid for, perhaps by an extra charge in the original contract. Not a bad idea, what?—J.G.

MANUFACTURING MANAGEMENT METALLURGY

Indirect Air Cooling Problems

Not Solved but Solvable

J. H. Geisse believes as result of knowledge gained in development of first experimental engine

CONSIDERABLE interest has been expressed in a system of engine cooling now described as indirect air-cooling, which had its origin at the Naval Aircraft Factory in Philadelphia in 1924 and has been under development ever since. Brief reference has been made to the system in these columns previously. The development work referred to has been under the direction of J. H. Geisse, at one time testing engineer in the engine department of the Naval Aircraft Factory and later chief engineer of the Comet Engine Co. Mr. Geisse presented a paper giving a review of the development work and the results obtained to date at the recent S. A. E. meeting, from which the following is abstracted:

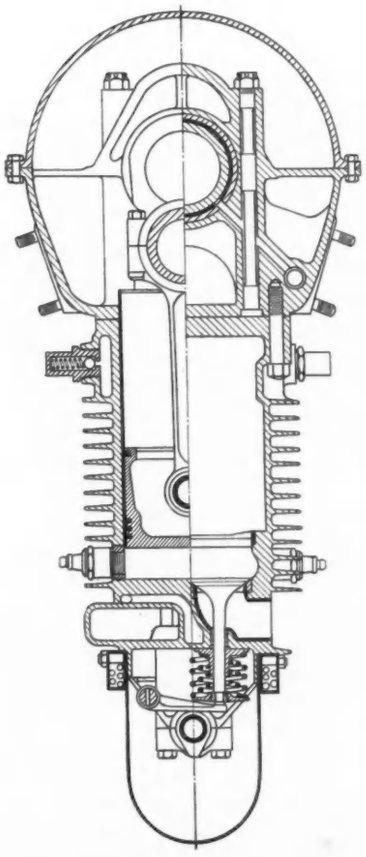


Fig. 1—Vertical section through Geisse indirect air-cooled engine

Preliminary tests were conducted at the Naval Aircraft Factory in 1925 on stock aircraft engines with cooling liquids of high-boiling point in the jackets. These tests were started to determine how much of a reduction in radiator size, and therefore in the drag, could be accomplished by increasing the mean temperature of the radiator. It soon developed that the reduction in radiator capacity made possible was only partly due to the higher mean temperature of the radiator, and in considerable measure to the increase in direct radiation from the engine jacket, and this suggested the possibility of a complete elimination of the radiator.

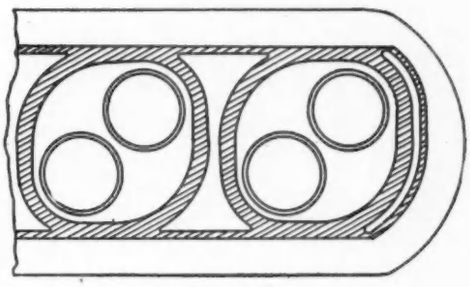


Fig. 2—Horizontal section through two cylinders

The next step was the construction, by the Comet Engine Company, of an engine specially designed for this system of cooling. It was a six-cylinder in-line inverted type of 4⅜-in. bore and 5⅛-in. stroke (451 cu. in.) and was designed to withstand the stresses of 3000 r.p.m. but was tested at 2400 r.p.m. The compression ratio was 6.25 to 1, and the weight, including coolant (12 lb.), starter and generator, 377 lb. Fig. 1 is a vertical section through one of the cylinders and Fig. 2 a horizontal section through two cylinders. The engine is of the open-ended dry sleeve type, which construction was chosen because of a complete absence of leakage troubles in an engine of similar design, in contrast with difficulties with a different construction. Sleeves of Ni-Resist centrifugal cast iron are used and are pressed into the block under a light press fit. The pistons are of Lo-Ex aluminum alloy.

In the first design no provision was made for forced circulation of the coolant, but fore-and-aft as well as cross-circulation was recognized to be desirable, and the jacket therefore was widened at the upper (crankcase) end of the block to permit circulation past the cylinder walls at this point. The other fore-and-aft passage was under the cylinder heads. The passage at the upper end of the block was intended also as an expansion chamber. To prevent loss of liquid as much as possible, only one opening was left into the jacket, and this was fitted with a pressure-relief valve.

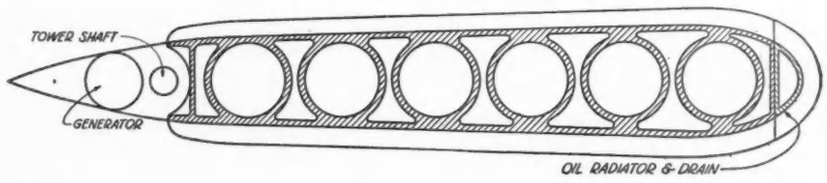


Fig. 3—Engine design laid out for minimum drag

The jacket wall had a total of 18 fins, 1 in. deep and spaced ½ in., four of which extended only half-way around the block, because of the manifold. The total fin surface is about 2150 sq. in., the direct cooling surface 580 sq. in., and the base area of the surface utilized for finning 520 sq. in.

Unfortunately in this first engine there was insufficient provision for oil drainage which, as shown by tests made when the fault had been corrected, caused an additional friction loss of 21 hp. The valve-timing also was faulty. It was found that the valve rocker arms flaked due to poor nitriding and had to be re-nitrided, and in this operation they were bent or distorted, which changed the timing.

After the oil drainage had been corrected the engine gave the following results (taken from chart):

Speed of revolution...	1800 r.p.m.	2100 r.p.m.	2400 r.p.m.
Corrected b.m.e.p. (lb. per sq. in.).....	111	98.5	91.5
Corrected brake horsepower	116	130	141.5
Specific fuel consumption (full rich)....	0.635	0.650	0.690
Specific fuel consumption (best setting).	0.430	0.455	0.450
Liquid temperature (deg. F.) max.....	378	390	401
Liquid temperature (deg. F.) average..	372	384	395
Mechanical efficiency..	92.5	89	87
Volumetric efficiency..	74	73	72

As the average temperature of the coolant increased from 180 deg. (water cooling) to 340 deg., the volumetric efficiency decreased from 74 to 71 per cent and the oil temperature rise increased from 67 deg. to 72 deg.

The effect of a change in the b.m.e.p. on the coolant temperature was investigated in two runs, one run with thermo-siphon circulation and natural aspiration and the other with forced circulation and supercharging. These runs confirmed the observation made in "boosting" direct air-cooled engines that the increase in load on the cooling system is not at all proportional to the increase in power output, the indications being that beyond a b.m.e.p. of 120 lb. per sq. in. very little increase is to be expected in the temperature of the cooling liquid.

In the tests of the engine a bad blow-by developed, and when the engine was later taken down it was found that two cylinders were badly out of round. No. 3 at the head end had expanded 0.001 in. across the block and contracted 0.006 in. along the block, leaving it 0.007 in. out of round. This tapered to trueness at the flange. No. 6 cylinder shrunk 0.001 in. across the block and expanded 0.002 in. along the block, leaving it 0.003 in. out of round. When the design was first laid down the opinion was expressed by some that the combination of liquid and direct air cooling would lead to distortion; Mr. Geisse, however, does not attribute the warpage (which was permanent) to the combination cooling system but rather to defect in the castings, either the block or the line.

The chief advantage of the indirect air-cooled engine over a radial air-cooled one is the reduction in air resistance, or what is known as form resistance. It is proposed to make the indirect air-cooled engine of a streamline form, with a tail cowl which can be used to house the tower shaft and accessories. "The two-row radial is forging to the front in this country," Mr. Geisse said, and he added that "if the addition of an extra row of cylinders to the radial is an advantage, the addition of more rows might be a further step in advance, and in that case the indirect air-cooling system would be applicable, where the direct air-cooling would not."

Bureau of Standards Report

The annual report of the Director of the Bureau of Standards has been issued and copies of it can be obtained from the Superintendent of Documents, Washington, D. C.

Acting Director Lyman J. Briggs reports that the regular staff at the close of the fiscal year numbered 1035 employees. With miscellaneous assignments the grand total was 1109 persons, a decrease of 62 as compared with last year. The turnover was very low, 2.7 per cent, against 5 per cent for 1931. There were no promotions.

As of June 30, 66 research associates were stationed at the bureau representing 28 associations, as compared with 95 associates from 45 associations last year. The bureau has continued its close cooperation with all Government departments and with public and private organizations interested in its work.

The congressional appropriations for the fiscal year 1932, exclusive of nonrecurring items, amounted to $2,749,570. By curtailing certain activities, postponing new lines of work, and exercising special care to insure economical operation, approximately $165,000 was turned back to the Treasury. Funds received from other governmental agencies for special investigations amounted to $417,370.

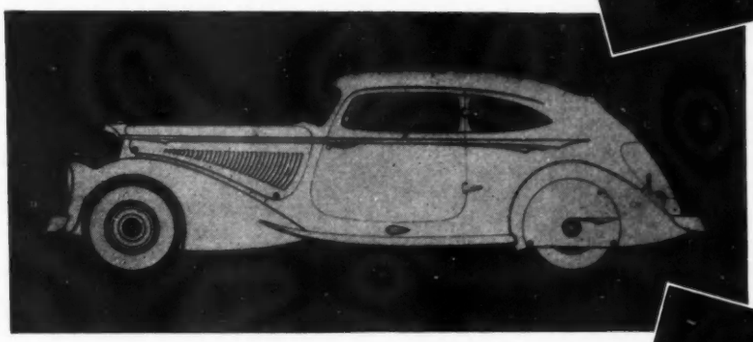
The report again stresses the desirability of a uniform patent policy with respect to patents developed in the service. An administration building is said to be urgently needed at the Bureau. This would release about 40,000 sq. ft. of space in laboratory buildings which is much in demand for experimental and testing work, and would bring the now scattered non-laboratory functions of the Bureau together. The Bureau also feels the need for a high voltage laboratory, an enlarged low-temperature laboratory, an applied-mechanics building, a building suitable for the precision testing of weights and measures, and a fire-resistance laboratory.

Car Makers in Art Display

In addition to the model designs illustrated here, the recent exhibition of the Arts and Crafts Guild in Detroit included displays of instrument panels, upholstery materials, radiator shells, wooden miniature dummies and color drawings of new and suggested automobiles, etc. Car maker members of the Guild include Chrysler, Hudson, Packard and Ford.

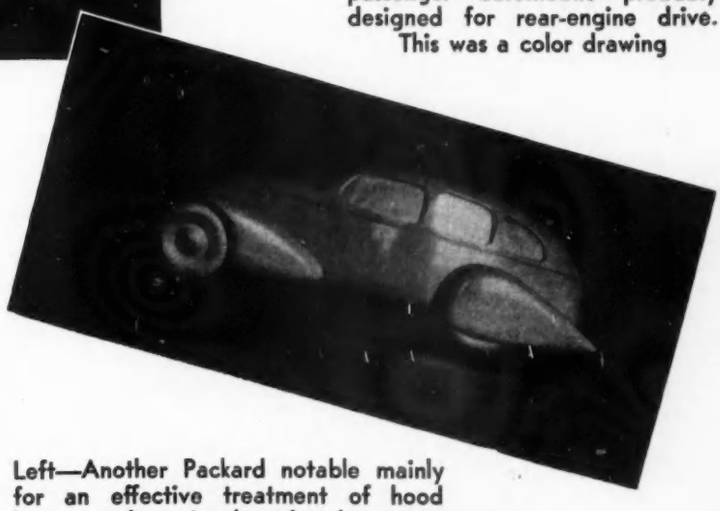
Below—A Packard 5-passenger coupe with cowled wheels, novel running board, large luggage compartment in back panel, which is carried back farther than usual, vee-shaped windshield, and radiator. Note the "windshield wiper" on the window glass of the left front door. Also headlamps streamlined into fenders. Rear luggage space may be used for mounting of spare tire in this model, concealed from view.

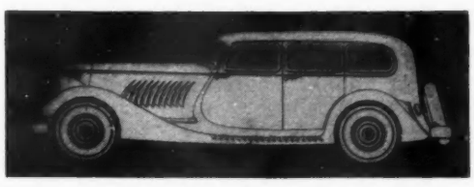
Top—A Packard without running board, and with entrance steps. Fenders are just that: fenders. Louvres bear a striking similarity to those used on the 1933 Oldsmobiles. Notice the absence of belt molding on this car.



Above—Packard streamlined six-passenger automobile—probably designed for rear-engine drive. This was a color drawing

Right—Side view of a highly streamlined miniature dummy Hudson car, with no running boards, completely cowled rear wheels and front wheels streamlined in the same manner as Campbell's new racing car





Left—Another Packard notable mainly for an effective treatment of hood louvres and running board to harmonize with body lines.

Magnetically Actuated Spray Valves

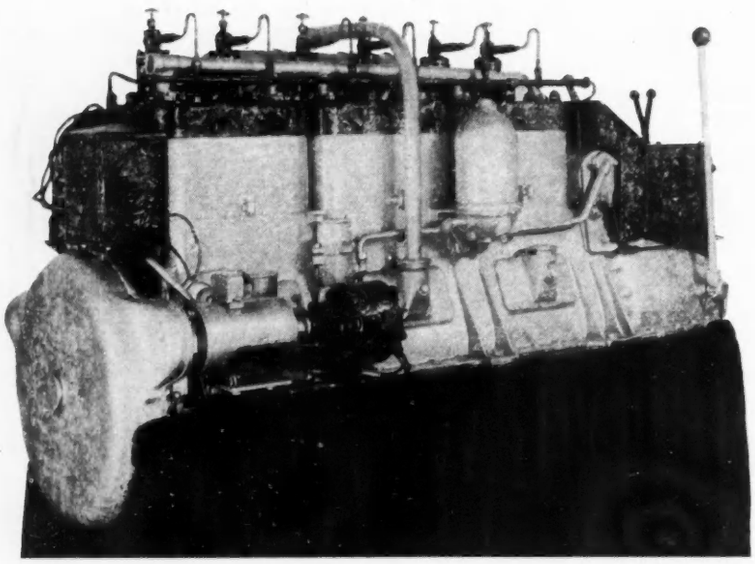


Fig. 1—Six-cylinder converted stock engine with the parts of the Atlasco system shown shaded dark

with Atlasco equipment low grade fuel can be burned in engines designed for gasoline

by P. M. Heldt

Engineering Editor, Automotive Industries

EQUIPMENT designed to make low-grade fuels available for use in engines built to burn gasoline, and thus save on fuel costs, has been developed by the Atlas Imperial Diesel Engine Co. of Oakland, Calif. The equipment does not make a Diesel out of an engine to which it is applied, as the compression used is moderate and not sufficient to ignite the charge. The fuel, however, is mechanically injected into the combustion chamber, hence the difficulties connected with distribution in multi-cylinder carburetor engines when using heavy fuels are eliminated. The system also obviates difficulties due to the high-compression and combustion pressure in Diesel engines and to ignition lag.

In the Atlasco system, the spray valves are magnetically operated, the armature of the magnet acting as a tappet and contacting an extremely light needle valve after taking up clearance of a few thousandths. By magnetic means it is possible to actuate a valve that is hermetically sealed within the fuel system and completely immersed in fuel under high pressure. As a consequence, it is not necessary to use stuffing boxes or lapped fits, and the attendant friction and leakage are eliminated. The valve lift being limited to about 0.010 in. and the weight of the valve kept down, the inertia force on the valve is very small, and the valve can be operated at high speeds.

The same as the mechanical inertia of the moving parts, so the electrical inertia of the operating circuit, or its inductance, has been reduced to the minimum. The actuating mechanism is so designed that the magnetic pull on the valve is a maximum when it is seated, and diminishes as it lifts from its seats. When the magnetic force ceases, the valve is returned to its seat by a spring.

Fuel is supplied to the valve under constant pressure, and metering is effected by varying the time during which the valve is held open. A comparatively recent development in electrical condensers makes it possible to secure a high capacity in a small space and at the same time make the condenser self-healing in the event of a puncture. By suitably adjusting the inductance and resistance of the circuit to the capacity of the condenser, the discharge current of the condenser can be made to rise and decay very rapidly, which makes it possible to lift the valve rapidly, and subsequently to return it.

When a condenser is connected to a charging circuit of low resistance and of a definite voltage, it becomes charged in a short time, a small fraction of a second, but the rate of charging depends on the resistance in the charging circuit. The time during which the condenser is connected to the source of charging current is controlled by an engine-operated switch or contact device, and the magnitude of the charge absorbed depends upon this time and upon the rate of charging, which latter can be varied by means of a manually-controlled resistance in the charging circuit. The greater the amount of charge absorbed by the condenser and then discharged by it through the valve-actuating magnet, the longer the valve will be held off its seat, hence the manually-controlled resistance in the condenser-charging circuit serves the function of an engine throttle.

It is obvious that under conditions where the condenser is not receiving a full charge, if the speed of the engine is pulled down by an increase in torque load, the quantity of charge received by the condenser is in-

Meter Fuel

creased, and as a consequence more fuel is injected, which tends to maintain the speed of the engine; inversely, if the torque load is eased and the engine tends to speed up in consequence, the charging time is decreased, and the amount of electrical charge and the fuel injected are reduced in consequence, so that the speed is automatically kept from reaching an excessive value. At full throttle, that is, with the resistance in the condenser charging circuit cut down to the minimum, the engine is said to have substantially the same torque characteristics as the conventional gasoline engine.

In order to eliminate the inherent difficulties of compression ignition which are the direct result of ignition lag, a system of electric ignition is employed. However, instead of the ordinary spark from a magneto or battery system, a high-tension arc of considerable duration is used, and the principle involved is said to be similar to that employed in the nitrogen-fixation process in which nitrogen combines with oxygen in the presence of an electric arc. Such an arc is produced in the combustion chamber of the engine prior to and during the injection period, at

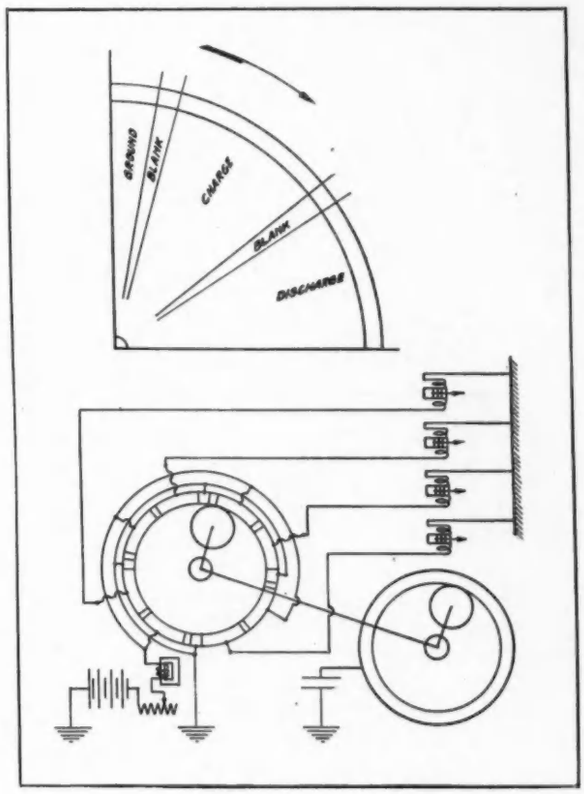


Fig. 3—Rotary switch and wiring diagram

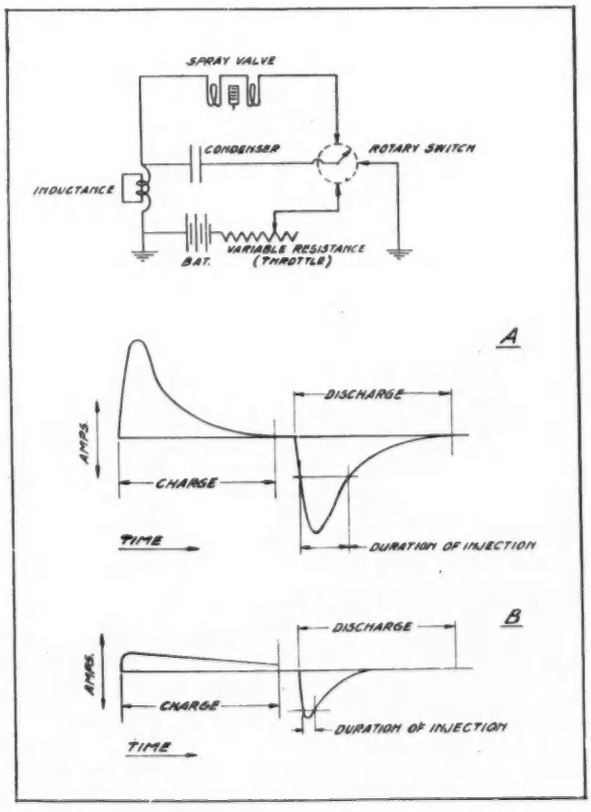


Fig. 2—The simplified injection circuit

Figs. 2A and 2B—One electrical cycle at full and part throttle respectively

the points of an ordinary spark plug. When no fuel is present, this arc is said to produce the yellow flame characteristic of the chemical combination of nitrogen with oxygen. When fuel is being injected, it is ignited by the arc, and it is claimed that the complete charge of fuel can be burned without smoke, combustion taking place directly from the liquid state without previous vaporization, and in uncompressed or unheated air. It is stated that even the hottest magneto spark when substituted for the electric arc would burn only a small portion of the fuel.

Current for the arc is supplied by a high-frequency alternating-current generator, the voltage of which is stepped up in a transformer, and which is distributed to the different spark plugs by means of a conventional distributor.

The system includes two groups of units, one serving the purpose of fuel injection and the other that of ignition; of these units, which are listed below, one is used per engine (of four or six-cylinder type) unless otherwise stated.

Fuel group: Spray valve (one per cylinder), rotary switch, condenser, throttle rheostat, high-pressure fuel accumulator, high-pressure fuel manifold, high-pressure fuel pump including electrically-operated pressure control; low-pressure fuel supply pump.

Ignition group: High-frequency generator (which may be built in same frame with battery-charging generator), transformer, breaker and distributor, and spark plugs (one per cylinder).

A diagram of the electrical circuits of the fuel injection system is shown in Fig. 2. The rotary switch alternately connects the condenser across the battery, for charging, and then across the spray-valve magnet coil, for discharging and opening of the spray valve. The object of the inductance in the charging circuit is

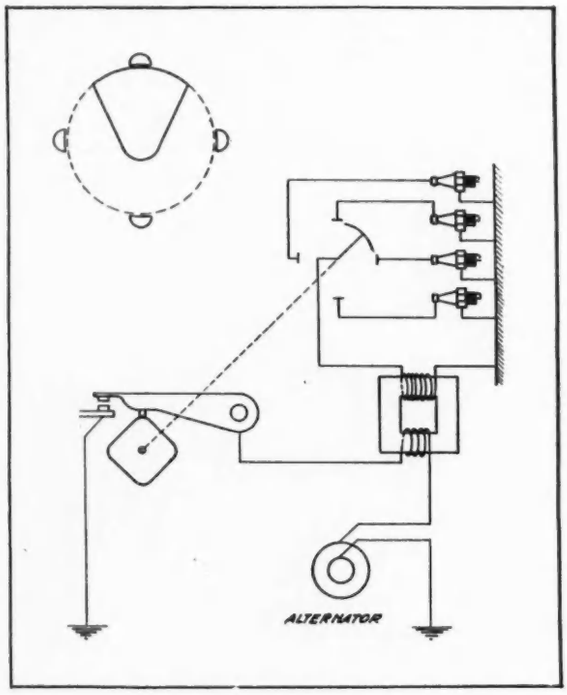


Fig. 4—Ignition wiring diagram

to limit the initial rush of charging current into the condenser and thus prevent burning of the switch points. Between discharging and charging periods the condenser is connected to ground in order to completely discharge it and prevent any accumulation of charge which might affect the accuracy of control. For instance, if one valve became disconnected, the succeeding valve would not receive an abnormal charge; on the contrary, the condenser charge would remain normal and all of the other cylinders would continue to fire regularly.

Fig. 2 also shows typical curves of charge and discharge. Diagram A represents completely charging and discharging the condenser with a low throttle resistance, i.e., at or near full load. The charging of the condenser through a low resistance takes place so rapidly that even at very high engine speeds, a full charge is absorbed each cycle. The discharging pole is likewise unchanged by engine speed and consequently the time of valve opening is constant, as is the quantity of fuel injected per cycle. Since the factors of the discharge, or spray valve circuit, are unaltered by speed or load, the duration of valve opening is affected only by the quantity of charge in the condenser. The conditions at partial load are shown in Diagram B where the charging current is limited by the variable throttle resistance. Because charging takes place so slowly, the process is not fully completed by the time the rotary switch has left the "battery" segment, and the total charge is thereby reduced. It is apparent that the quantity of the charge is represented by the area under the curve, and that the area under the charge and discharge curves must always be equal. If the engine should speed up, the charging period, and consequently the amount of charge, would be reduced. This makes the engine self-governing under part throttle, as already stated.

The rotary switch and circuit used on a four-cylinder engine are shown diagrammatically in Fig. 3. The blank segments in the rotary switch are for added insulation only.

The ignition circuit is shown diagrammatically in Fig 4. Alternating current is supplied by an inductor type generator of such frequency that a voltage wave, or half-cycle, is produced during approximately each 7.5 deg. of crank rotation. This current is supplied to the primary of a step-up transformer. The generator voltage naturally varies with engine speed, so the ratio of transformation is such as to provide sufficient voltage at idling speed to satisfactorily ignite the fuel.

A conventional distributor is used, except that the rotating segment is long enough to span the contacts of two cylinders. To avoid drawing an arc as the segment passes from one contact to the other, the primary circuit of the transformer is broken during this interval by means of the usual automotive type breaker. In the experimental engine, in order to avoid difficulties with synchronization, the proportions are such that the duration of the arc in the cylinder is approximately 100 deg. of crank angle, although a duration only slightly in excess of the injection duration would be ample for complete ignition.

The electric spray valve is quite simple in its mechanical details, the armature and needle valve being the only moving parts. They are loosely fitted, which allows the needle valve stem to center itself on its seat without accurate lapped guides or packing glands to cause misalignment or sluggish action. Its light weight makes a heavy return spring unnecessary; the one used exerts a force of only 10 lb., and is said to give prompt action even at valve speeds corresponding to 12,000 r.p.m. of the engine. The duration of spray valve opening is about one and one-quarter thousandths of a second at full load.

The spray nozzle, which incorporates the needle valve seat at its lower end, is of the conventional type, except that the spray hole is of unusual size for a small engine, being 0.018 in. in diameter. This large hole is necessary to pass the requisite amount of fuel in the

(Turn to page 299, please)

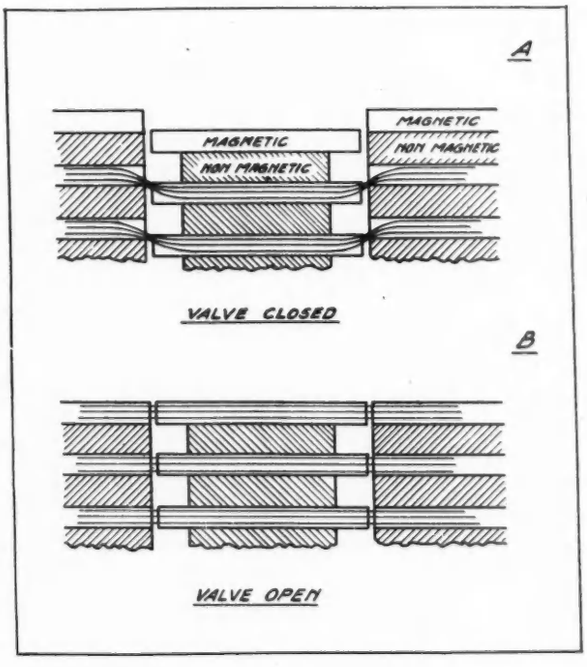
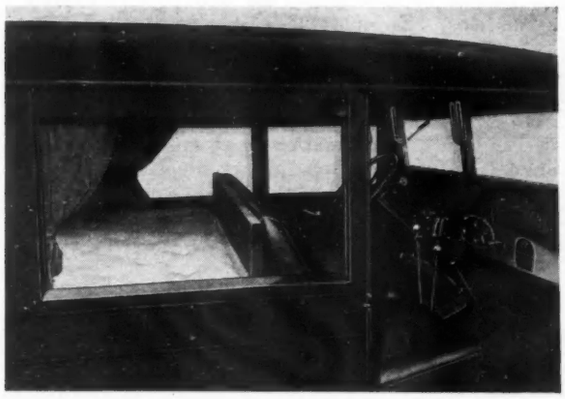


Fig. 5—Magnetic path in spray valve with valve closed and open

G. M. T.

brings forth improved models in heavy duty line



Detail of the new G.M.T. sleeper cab

TWO new trucks in the 3- and 4-ton range respectively, with longer wheelbases, more body space back of the cab, and with a new engine having a flatter torque curve and better fuel economy, are announced by General Motors Truck Company. The new T-33 in the 3-ton, and the T-43 in the 4-ton range sell at $345 and $380 less than the T-31 and T-41.

The T-33, listing at $1225 for the 142-in. wheelbase, has a straight rating of 13,000 lb., compared with 14,000 lb. for the T-31. In addition to the new engine it has a new frame, new rear axle, new instrument panel and increased equipment.

Changes in the Series 257 engine, with which both the T-33 and T-43 are equipped, include a new arrangement of accessories, with the water pump now located in the front of the block, for integral drive with the fan, and adoption of downdraft carburetion, with a center-outlet exhaust. Cylinder blocks are now cast of nickel-chromium iron. Flat cam followers are used, and as a result of the relocation of the water pump the front end drive gears now comprise only the steel crankshaft pinion and the cast-iron camshaft gear.

With the adoption of downdraft carburetion the valve timing has been slightly changed, the inlet valves now opening with 4 deg. lead and the exhaust valves closing with 27½ deg. lag. This is said to improve the economy in the higher speed range. The new carburetor is of the Zenith plain-tube type and includes an accelerating pump and an economizer for part throttle.

The new water pump is of the centrifugal type and its impeller shaft is supported on double taper roller bearings at the fan end and on a babbitted bearing at the pump end. The crankcase ventilation system has been changed from a pressure to a vacuum system, to prevent oil vapors from being blown out of the crankcase.

The center-outlet exhaust manifold is of the six-port type. By moving the fuel pump to the camshaft side of the block, more positive operation through a shorter shaft is assured. Generators are of the new Delco-Remy type and are swivel-mounted for belt-adjustment. Distributors, also of Delco-Remy make, are now of the full-automatic type.

As compared with the T-31, the T-33 also has a deeper frame of 8-in. channel section. Equipment includes a new airplane-type instrument panel, a dash fuel gage and larger batteries of the 15-plate type. Stop and tail light now are standard equipment.

Changes on the T-43, which has a straight rating of 16,000 lb., are similar to those on the T-33.

General Motors Truck Company also recently introduced two new trucks of larger capacities, the T-51H and the T-85H. The T-51H is similar to the T-51 of 19,000 lb. straight rating, but has a rating of 22,000 lb., the increase in capacity being due to the use of a double-reduction rear axle and the same rear support and drive structure as used on the heavy-duty T-61. The T-85H has a straight rating of 34,000 lb. and differs from the T-85 of 30,000 lb. rating in having the heavier double reduction axle of the H series.

Another item of interest recently developed by G. M. Truck is a new type sleeper cab with unusually large amount of room. It is available on all models from the T-85 series up. Below the berth, accessible through a panel in the right side of the cab, is a compartment which can be used for tools or the installation of a supplementary 90 gal. gasoline tank. It is opened with a removable door handle.

Coal Oil Gains in Great Britain

As an index of the progress being made in the production of liquid fuels from coal it is of interest to record that a contract for a 12 months' bulk supply of oil made from British coal has been concluded by the Admiralty with the firm of Low-Temperature Carbonization, Ltd., of London. The oil, which is a by-product in the manufacture of smokeless fuel, is said to be supplied at a figure which compares favorably with the price of first-class bunker petroleum. No changes were required in the boiler equipment and trials at sea are said to have shown the new fuel to be most satisfactory.

The

Low Pressure Tires and Unsprung Weight

EDITOR, *Automotive Industries:*

The development of low-pressure pneumatic tires has opened a new field of automotive design. With solid or high pressure pneumatic tires it was found desirable to keep the ratio of unsprung to sprung weight low, so that the tires might stay on the road most of the time, and both tires and unsprung weight be protected from excessive pounding. With low pressure pneumatic tires, however, high unsprung weight is permissible, since road irregularities displace violently only that portion of the tire in contact with the road. In fact, the suggestion has been made that the whole car be unsprung. Unfortunately other factors make the elimination of springs undesirable: the dimensions of the tires used would limit the maximum road irregularity that could be traversed, and more important, no damping mechanism would be practical. A springless car fitted with low internal friction tires would probably outbounce a conventional car with well-lubricated springs and no shock absorbers.

The use of heavy axles with low pressure pneumatic tires would permit the development of new chassis arrangements, as well as the utilization of designs previously discarded for reasons not now applicable. The increased weight of the unsprung portion of the car can perform at least one useful function: the reduction of the transmission of high frequency shocks and noises to the car body from the road surface. The engine might be directly supported on one or both axles. A gearless two unit hydraulic transmission, or motor portion thereof, might be mounted on the driving axle or axles.

A possible redesign of the present-day car could incorporate an unsprung front end and a sprung rear end. This would give the maximum stability on turns, and would minimize the front end nervousness aggravated by the introduction of the low pressure tires. Furthermore, the rear springs would permit negotiation of roads too rough for the unsprung design mentioned above, as well as providing maximum resilience for the comfort of the rear seat passengers. Sufficient damping could probably be provided by rear spring hydraulic controls if care were taken to separate sufficiently the center of gravity of the car and its dynamic center. This same design might be extended to a rear-engined car, possibly with the engine mounted on the rear axle.

A different design would mount the rear wheels rigidly to the car and spring the front wheels. To obtain maximum steering ease and comfort the engine might be rear mounted, the front wheels separately sprung, and the front tire pressure carried fairly high.

A. P. STEENSEN.

What Washington Does for the Industry

EDITOR, *Automotive Industries:*

As a result of the provisions of the Economy Act, passed by the last Congress, I believe you know, in a general way at least, that the Bureau is now obliged to charge for certain of its services. Although we have tried by every conceivable means to make known generally the effect of that Act on our services, a great many inquiries are still being received.

To clarify that situation as regards exact charges to be made and to describe again the make-up of the paid individual services of this Division for the benefit of prospective users, this letter is written. Inquiries being received constantly confirm my own opinion that there still exist many firms or individuals who know little of the services described below, but who need them and are quite willing to pay the nominal fee prescribed.

In order to get this information before the greatest possible number of firms who are interested in the exportation of automotive and allied products, the thought occurred to me that you might have some space in your publication to call the attention of your readers to the following services:

One of the greatest single services of the Automotive Division is what is known as the "Automotive Foreign Trade Manual," a loose-leaf publication in 5 volumes. Inexpensive binders are used and from 40 to 50 pages of new or revised automotive foreign trade information are issued each week. The Manual contains a fund of information most valuable to the exporter of automotive or allied products.

For *most foreign countries* there are pages containing information concerning rates and bases for assessment of duties, consular requirements, customs regulations, automotive taxation, packing methods, and other basic data such as population, topography, commercial languages used, area, type of government, currency, climate, favorable selling seasons, industries, chief imports and exports, types of roads, mileage, inland waterways, principal ports, etc.

The Manual also contains a great deal of up-to-date current data, such as regular quarterly market surveys, by countries, of selling conditions in the automotive trades; monthly or quarterly figures showing the automotive exports and imports of the various countries; and periodic figures (monthly, quarterly or annual—whichever are available) showing registrations by makes by countries. The subscription price to this weekly service is $5.00 per annum. A small additional charge (covering only the actual cost to us) is made for the binders and the indexes.

Automotive World News, issued as a weekly release of the Automotive Division, is a publication containing up-to-the-minute cabled information reporting existing market and sales conditions by countries, notices of trade opportunities, registration and import information, analyses of our export trade in specific automotive products, notes on prevailing economic conditions throughout the world, special stories of the demand in specific countries for certain types of automotive products which the American industry is interested in supplying; occasional graphs showing sales, stocks on hand, etc., of motor vehicles; cabled news of changes in tariffs, taxes or regulations; manufacturing and engineering developments; monthly market surveys, and other miscellaneous data of interest to automotive exporters. The *News* serves as a

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guide to the special services that are available in the division. The subscription price of this weekly release is $1.00 per annum.

At the present time, the Automotive Division releases monthly two statistical statements. Statement No. 2700 shows exports of all types of automobiles, parts, accessories and service equipment from the United States to the many foreign countries. Statement No. 2701 indicates similar information concerning marine engine and motor boat exports. At the present the price of these statements is 10 cents a copy up to and including December, 1932. Beginning with January, 1933, statement 2700 will be broken down into several individual statements, and the price for each will be approximately $1.00 a year.

The purpose of this letter is an endeavor to leave no stone unturned in bringing the above services to the attention of firms and individuals who have not previously been receiving such services and who, as a consequence, know little about them. We have, of course, circularized direct all contacts who have used these services in the past.

A. W. CHILDS,
Chief, Automotive Division.

The Steam Automobile

EDITOR, *Automotive Industries:*

Simplification of control is one of the engineering problems confronting the automotive industry. The solution has been sought in the addition to the clutch and transmission of various devices such as automatic clutch operators, free-wheeling clutches and synchronizing clutches. A limited number of designs have incorporated automatic mechanical, electric or hydraulic transmissions. It seems probable that the real solution lies in the discarded steam automobile.

The steam automobile was discarded for a number of reasons, chief of which was the fact that steam engines were old and internal combustion engines were new. Steam cars were ruled off the race tracks because of their blinding exhaust. The array of valves and levers in the driving compartment awed the prospective purchaser. The danger of high pressure steam was given wide publicity by gas car sellers. However, today the objection to the steam automobile as well as the car itself are forgotten. With the present knowledge of oil combustion, materials and production methods there is no engineering objection to the return of the steam automobile.

The driving compartment could be cleaner than in the present automobile. A reversing lever on the instrument panel, the conventional brake and steering controls, and a pedal, first opening the throttle, then feeding more fuel to the flash boiler, and finally lengthening the cut-off, could serve to control the car. Ignition of the pilot burner could be electric, and controlled by a locking switch. All other apparatus could and should be automatic. The .battery charging generator could be driven from the driving axle. It should be possible to combine performance, economy, simplicity of control and relative simplicity of mechanism in a steam automobile.

A. P. STEENSEN.

Pawl Disengagement of Spicer Easy-Shift Gear

EDITOR, *Automotive Industries:*

In your issue of Oct. 22, the description of the very interesting Spicer "easy shift" unit appears to be garbled. Judging solely from the illustrations, I would describe the pawl disengagement as follows:

This is accomplished in the following manner: the dog clutch carries a splined ring, 15, which again is placed into an outer ring, 16. These two rings form the inner and outer members of an overrunning clutch by means of rollers which are between the two. The outer ring, 16, or cam member, must rotate with drum, 18, all the time, because they are mutually engaged by wedge-shaped teeth called cams. The cams are integral with the outer ring while the corresponding cams of the drum are formed on a splined ring, 17, permanently assembled with the drum.

If the inner ring, 15, rotates faster than the outer ring, 16, the latter is accelerating likewise by means of the jamming rollers, and since the drum is splined to the forward end of the universal joint extension, the propeller shaft is accelerated also. The sloping sides of the cams, however, set up a spreading action, and since the cam member cannot back out, the drum will move forward against the coil spring pressure, 19, and presses on the lever, 20, which in turn lifts the pawl, 13, out of its groove.

A. L. VARGHA,
Engineering Department
Chevrolet Motor Co.

Detroit Portable Sheet Metal Tester

A portable sheet metal tester, model V, for metal up to 1/16 in. in thickness has been introduced by the Detroit Testing Machine Co., Detroit, Mich. This device, for determining the drawing qualities of sheet metal, was developed especially for stamping shops and those requiring occasional tests not warranting the purchase of more costly laboratory equipment. It is also recommended for field work, as results are said to check accurately with those obtained on the larger standard machines.

It is hydraulically operated and has the same hydraulic clamping device as the company's large motor driven machines. This arrangement eliminates hand clamping and the clamping pressure is always in proportion to the load applied to the punch.

The test consists of gripping a specimen between circular jaws and applying pressure by means of a rounded punch or ball until a crack is produced. The depth of draw, load required and other characteristics are then noted.

British Car Output Greater In 1932 Than In 1930 or 1931

THERE was no depression in the British automobile industry last year, to judge by figures just published in *Engineering* of London, in a review of the activities of that industry during the past year. The number of people employed in the motor-vehicle, cycle and aircraft industries increased in the course of the year, the number of unemployed decreased; there was a notable increase in the number of cars produced as compared with 1931, and the number of British private cars exported closely approached the all-time record set in 1929.

Before the war Great Britain was the greatest automobile-importing country in the world, but last year her imports of private cars shrank to less than 10 per cent of the cars exported by her. Even if allowance is made for the facts that the average value of the cars produced and exported, on a gold basis, has undoubtedly declined considerably, and that a number of popular foreign makes, notably Ford, Chevrolet and Citroen, are now produced in England, the picture of last year's development in both home and export markets is a very encouraging one from the British standpoint.

The numbers of private cars produced during each of the last four production years (ending Sept. 30) were as follows:

1929.....	182,250	1931.....	158,298
1930.....	171,052	1932.....	171,244

During 1931 there was a notable decline in production, but it will be remembered that during the latter part of that year Great Britain decided to go off the gold standard, and that thereupon the pound sterling quickly dropped to about 70 per cent of par. This had the effect of a proportional decrease in the price of British cars in countries which retained the gold standard.

There are of course, a number of factors which must have influenced British automobile trade in 1932. In the first place, the world-wide depression no doubt induced a great many buyers to go in for the smaller cars which are principally produced in England. Then, the preferential tariffs adopted as a result of the Ottawa conference had the effect of a barrier tending to keep non-British cars out of the Empire. Finally, the abandonment of the gold standard by Great Britain made it possible for British manufacturers to sell in foreign markets at much lower prices than previously. The advantage extended even to countries that also abandoned the gold standard, for while this meant an immediate adverse change in the exchange rates on countries that remained on the gold standard, it did not affect the exchange rate on Great Britain materially.

That the abandonment of the gold standard was the principal factor in Great Britain's brilliant showing in international automobile commerce for 1932 is indicated by the fact that whereas exports of private cars to dominions increased by from 33 per cent in the case of New Zealand to 75 per cent in the case of South Africa (which remained on the gold standard), exports to all foreign countries combined increased about 200 per cent.

Registrations of private cars in Great Britain have increased consistently during the past ten years, the numbers registered during the last four years having been as follows :

1929.....	998,489	1931.....	1,110,000
1930.....	1,075,081	1932.....	1,148,000

To effect a net increase of some 38,000 cars in use it was necessary to sell about 144,000 cars, which would indicate that 106,000 cars were either scrapped or not registered by their owners owing to hard times, high taxes, etc.

Imports of private cars into Great Britain, which as recently as 1925 exceeded 40,000, declined to 2450 last year, which, however, was a slight increase as compared with 1931. Imported cars are largely of the high-powered type, and these are handicapped in the British market by the high horsepower tax and the high tax on fuel. In 1932 the situation was further aggravated by the depreciation of the pound, which, of course, meant an increase in the selling prices of imported cars. *Engineering* observes that the fact that net imports of complete cars should have increased in the face of these deterrents indicates that there is an irreducible minimum of motorists in Great Britain who are prepared to pay for a vehicle with plenty of power.

Exports of private cars of the leading producing nations during the past four years are given in Table I. It will be seen that only the exports from Great Britain showed an increase in 1932 over 1931. The total exports of these countries decreased to a little over 22 per cent of the 1929 level, and during the past year the decrease was almost exactly 25 per cent.

While the output of commercial vehicles in Great Britain showed a moderate decrease during the past year, from 67,292 to 61,475, it was still greater than during any year previous to 1930. Exports of commercial vehicles increased heavily, from 5320 in 1931 to 8000 in 1932. The increase was entirely in chassis, the number of complete vehicles exported having remained the same.

Registrations of commercial vehicles in Great Britain increased only slightly during the year, from 485,000 to 490,000, but imports into the country dropped sharply, from 1507 to 347. Exports of commercial vehicles of the principal producing nations for the past four year are given in Table II. It will be seen that the total number of commercial cars exported by these nations last year dropped to less than 15 per cent of the 1929 figure, but Great Britain, after losing some trade in 1930 and 1931, is back practically to the 1929 level.

TABLE I—INTERNATIONAL EXPORTS OF PRIVATE CARS (NUMBER)

Exports from	1929	1930	1931	1932
U. S. A.....	347,968	153,088	90,000	50,000
Canada	64,863	28,842	9,000	5,000
United Kingdom....	33,798	23,208	18,992	30,050
France	39,121	24,557	22,500	15,500
Italy	20,100	17,737	12,000	5,600
Other countries.....	10,000	5,000	2,000	10,000
Total	515,850	250,432	155,492	116,150

TABLE II—INTERNATIONAL EXPORTS OF COMMERCIAL VEHICLES (NUMBER)

Exports from	1929	1930	1931	1932
U. S. A.....	198,234	84,452	52,000	25,000
Canada	36,848	15,711	5,000	3,000
France	9,904	6,601	3,500	1,800
Italy	3,589	3,000	1,500	291
United Kingdom....	8,233	6,545	5,320	8,000
Total	256,808	116,309	67,320	38,091

4 WHEEL DRIVE UNIT

for six-wheel truck produced by Gear Grinding Machine Co.

A NEW four-wheel-drive unit has been developed by the Gear Grinding Machine Co. of Detroit, manufacturers of the Rzeppa constant-velocity universal joints. It can be applied to virtually any type of well-known two-wheel-drive truck. It is not an accessory, however, but requires replacement of a number of standard parts and strengthening of the frame to permit carrying of the heavy loads possible with this unit.

The Grico four-wheel drive, as it is known, differs from the conventional six-wheel unit in that a two-speed transfer case is located between the two rear axles. From this transfer case the drive is carried forward to one axle and back to the other, there being a third differential to equally divide the torque.

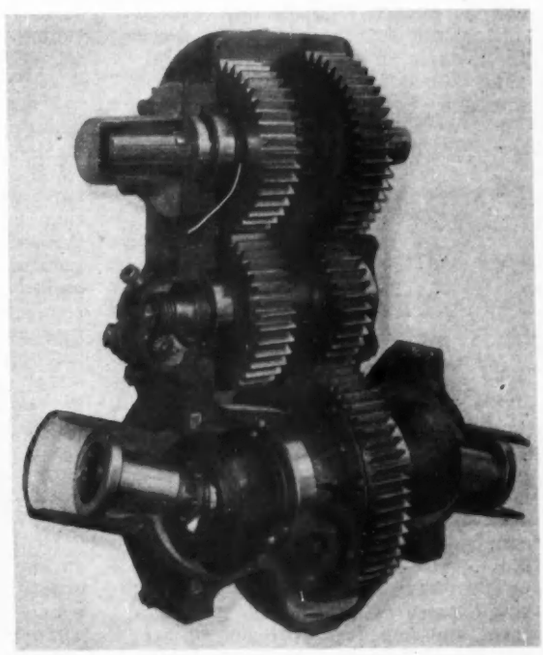
The transfer case itself is mounted in the frame, while the axles are carried on two sets of springs, one above and one below a central trunnion mounting on either side.

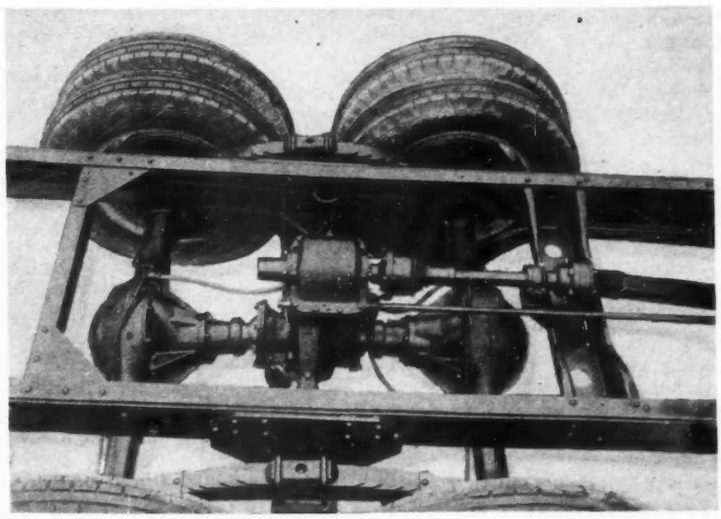
Briefly, the regular propeller shaft, instead of being connected to the driving pinion of the forward axle, transmits the engine power to the top shaft of the transfer case, through a Rzeppa constant-velocity joint. On this shaft, as may be seen in Fig. 1, there are two gears, engaged at will by a sliding jaw clutch on the splined shaft. These gears are in constant mesh with others on the intermediate shaft of the transfer case. The latter are splined on the intermediate shaft, and the forward one of these two gears drives a "ring-gear" below it.

This ring gear is carried on a differential carrier within the gear, the differential being of the two-pinion type. It divides the torque equally to stub shafts extending forward and backward from the transfer case. Between these stub shafts and the forward and rearward axles are two Rzeppa universal joints. Details are shown in the drawing, Fig. 2. In the case of the Ford truck, two Ford truck axles are used, while on the Chevrolet and other trucks, Clark axles are provided. The axle spacing is 40 in. in every case.

It will be noted that the rear end of the top shaft in the transfer case is splined and extended beyond the case, for power take-off purpose. The intermediate shaft has the speedometer gearing at its rear end. All shafts are mounted on large capacity ball bearings.

Since the transfer case is mounted in the frame, it is spring-supported. The spring mounting of the axles is highly flexible, with springs shackled both front and rear. This installation is made possible through the use of constant-velocity joints which permit angularities of the short "propeller shafts" between the transfer case and axles up to 38 deg.

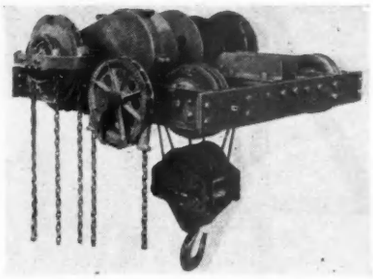




At the left is shown a unit in place on a G M T 140-in. chassis, while in the view above can be seen the propeller shaft and universal joints.

NEW DEVELOPMENTS

Automotive Parts, Accessories and Production Tools



All Stainless Tape-Rule

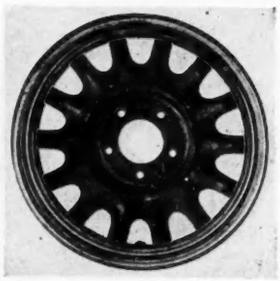
As a companion to its "Crescent" Tape-Rule, the Lufkin Rule Co., Saginaw, Mich., has just brought out an "All-Stainless Crescent" No. S-696.

In this new flexible-rigid, 6-ft. Tape-Rule, stainless steel is used not only for the graduated blade and its sliding hook, but also for the case. This makes the article rust-proof and non-corrosive.

It is offered marked inches to 16ths for general use; and for engineers' use there is No. S-696-D, which is graduated, upper edge in feet, 10ths and 100ths of feet; lower edge in feet, inches and 16ths.

New Budd Pressed Steel Wheel

A new type of steel artillery wheel, consisting of a single pressing of steel, has been developed by Budd Wheel Co. So far it has been adopted by seven different automobile manufacturers, we are informed. The wheel can be molded to meet different requirements as to appearance. From the outside or front the spokes appear to be solid and of a great strength, but they are, of course,



hollow, and they can be either left open on the inside or else the inside can be closed by a steel reenforcing plate.

The entire wheel is made from a single piece of sheet steel, in spider form, and embodies a pronounced convex shape, "flowing" from the spokes outward to the hub cap. The ends of the spokes are folded over and riveted to the rim.

The wheels can be finished either in lacquer or in bright chromium. They are said to have about the same weight as wire wheels, and are available in all sizes for standard tires as well as for the new low-pressure tires.

An advantage claimed for the wheel is that in case of damage it will not break and let the car down, but merely bend out of shape. It lends itself to spray-booth practice, and therefore is economical to handle from the car manufacturer's standpoint.

G. E. Electron Tube Tester

Flaws and cracks in tungsten or molybdenum wire, copper tubing and similar materials, are detected by a new vacuum tube oscillator developed by the General Electric Co., Schenectady, N. Y. This device already has been found of great value in the manufacture of General Electric products where the visual detection of small defects is a very slow process, requiring extreme care, and is often entirely inadequate.

Although originally designed to locate longitudinal cracks in tungsten or molybdenum wire, the device is being successfully used in the General Electric shops to find flaws in copper tubing. In both cases, flaws are detected by means of eddy currents induced in the material inspected.

The tubing test is based upon the change in electrical resistance of a small section of tubing, which occurs when a defect is included in it. Eddy currents are induced in a small portion of the tubing by passing it through a coil connected in a Dynatron oscillator circuit. Two of these oscillators are coupled together and connected through an amplifier to a loudspeaker and a meter. Each of the oscillators is provided with a coil either or both of which may be used as test coils through which to pass the tubing.

Loney Wheel Balancer

H. C. Loney Co., Detroit, has placed on the market adjustable wheel balancers consisting of small weights which are attached to the rim by means of set-screws. These weights permit balancing tire and wheel assemblies on the car if necessary, and do not call for disturbing the tire nor drilling the rim. Placed on the inner edge of the rim, they are out of sight. The balancers are made of non-corrosive metal. Two are used per wheel.

Chisholm-Moore New "Cyclone" 2-Speed Drum Hoist

A new drum hoist in a compact combination of the well-known "Cyclone" wire rope hoist and a geared structural carriage is announced by the Chisholm-Moore Hoist Corp., Tonawanda, N. Y. It is designed for use on a double I-beam overhead traveling crane.

The hoisting unit is equipped with a dual chain sheave and two pendant hand chains. The larger sheave provides low speed ratio for capacity loads; the smaller sheave providing high speed ratio for light loads. Minimum effort is required to operate.

Capacities range from three to thirty tons inclusive. Weston type disc brake is said to insure absolute load holding capacity and perfect control at all times. Fourteen ball and roller bearings are included in the hoisting mechanism; an anti-friction bearing at each rotating point.

Haveg Corrosion Resistant Equipment

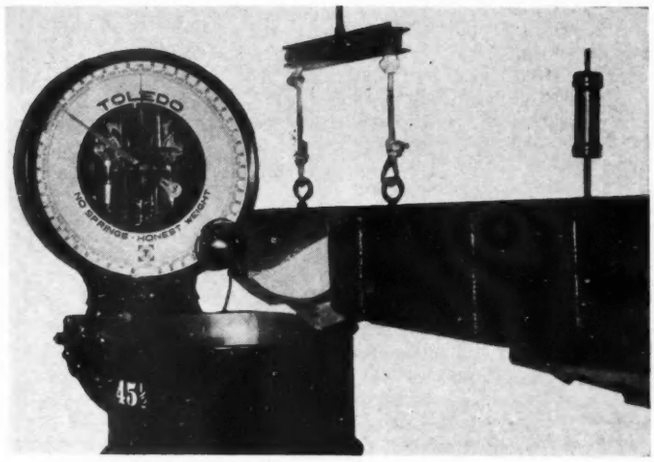
Corrosion-resistant chemical equipment of value in pickling and plating operations in the automotive industry now is available through a unique process developed in Germany. It is being handled in this country by the Haveg Corp., a subsidiary of the Continental-Diamond Fibre Co., Newark, Del.

The material, Haveg, is produced by using a specially selected asbestos base and combining it with a phenol-formaldehyde type of resin. It is claimed that the resulting asbestos-resin compound is completely resistant to the attack of many acids, solvents and other chemicals. The compound may be molded into any desired shape to produce vessels for any requirement. One-piece seamless tanks have been made up to 10 ft. in diameter and 10 ft. in length.

Haveg is a light-weight material having a specific gravity of 1.6. It is said to stand shock and has a compressive strength of 10,400 lb. per sq. in. It can be cut, drilled, turned, or sawed with facility.

Toledo Filling Machine

Manufacturers who have had difficulty in the packing of products, such as nails, pins, washers, nuts, etc., can now obtain greater accuracy, lower labor costs, and greater time-savings through the use of the new Toledo Vibrator Filling Machine, recently announced by Toledo Precision Devices, Inc., Toledo, Ohio. This new



device controls the automatic feed of materials from supply bins to the scales and the automatic weighing out of predetermined amounts in packing operations.

The machine consists of a Toledo scale of high accuracy, an "electric eye" cut-off attachment, and a vibrator holding the articles to be packaged. It is simple to operate. Weights equivalent to that of the filled container are placed on the weight platter of the scale. For drafts of more than 30 pounds, the scale is set for the net weight of the commodity plus the weight of the container by setting the poises on the beams, or by means of a set back indicator. The vibrator, attached to the scale, is supplied with the commodity from a larger hopper or bin placed nearby. The operator then presses a button. This puts the vibrator in motion and the articles run into the container. At all times the operator can watch the progress of the flow by glancing at the scale chart. When the predetermined amount has entered the receptacle, the electric cut-off stops the flow by stopping the vibrator. It is capable of filling as many as 200 one-pound containers per hour, to a tolerance of 1/64th of an ounce.

Weldit Vulcan Flame Cutter

At the National Metal Congress, the Weldit Acetylene Co., Detroit, Mich., showed the first model of the Vulcan automatic flame cutter for the rapid shaping of all kinds of forms cut from steel plates of ⅛ to 12 in. in thickness. The machine operates on tank acetylene, city or natural gas, butane, hydrogen, etc.

It cuts accurately to a drawing or thin metal template over which is guided the tracer unit, power driven by a 1/30 hp. electric motor. It is said to make a clean cut with sharp, true edges. In mild and low carbon steel, the structure of the metal at the surface is said to be practically unaffected.

This machine should be of interest in every phase of automotive activity, particularly body plants and tool rooms in general. Three sizes are available having a working surface of 24 x 36, 36 x 60, and 48 x 84 in. respectively.

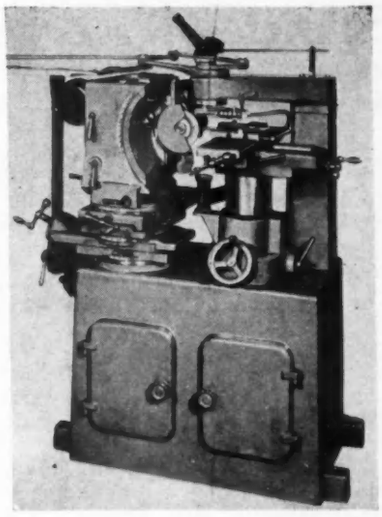
Naumann Profile Grinder

George Scherr Co., American representatives for Carl Zeiss instruments and other precision machinery have just announced the introduction of the Naumann profile grinder for making templet gages, forming tools, and other work of irregular contour. Its maximum range is 6 x 2-9/16 in. and pieces up to 1-7/8 in. thick can be accommodated.

The principle involved is the use of a drawing 50-times magnification drawing, from which the contour is reproduced through the pantograph. The pantograph govern a hairline cross in a Zeiss microscope, through which the work is observed under 40x magnification. In this way the machine grinds directly from the drawing, reducing any possible errors to 1/50th part.

There are three main units: the grinding wheel head, the work slide, the pantograph with microscope and drawing board.

The grinding wheel head is mounted on two slides which can be turned in any direction. Incorporated in the wheel head is a gear box to which the wheel spindle and the individual motor are attached. The drive is by endless belt. The wheel spindle is provided with a reciprocating stroke, up and down, which is adjustable and for which two speeds are available.

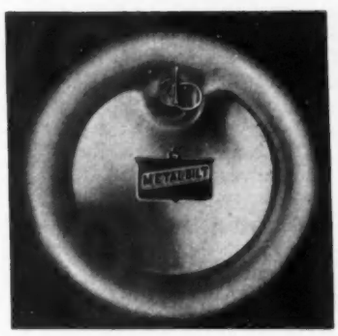


The wheel head swivels in two vertical planes at right angles to each other, so that forming tools with different rakes can be produced.

During the grinding operation, the gradual formation of the profile to be produced on the work is constantly observed with the aid of a Zeiss microscope, having a magnification of 40x and showing a hairline cross in the field of view. The procedure when grinding is to feed the wheel into the work until it touches the hairlines cross, as viewed in the ocular.

Detroit Hub Cap and Wheel Lock

An accurately balanced hub cap and wheel lock which may be used not only on the spare but on running wheels as well is offered by the Detroit Metal Specialty Corp., Detroit, Mich. The Metal-Bilt hub cap is constructed by reinforcing a heavy steel inner shell with a heavy gage cross plate that supports the lock



and is so designed that it balances the cap. All possibility of rattle is said to be eliminated through the use of tempered steel fastening springs. A tempered steel lock bolt and tongue prevent the cap from being pried loose. The outer shell or cover is made of brass, finished with a heavy chromium plating.

This unit offers an unusual protection against theft of not only the spare tire but the others as well.

Estimates Place February Car-Truck Output at 10 Per Cent Under January

January Passenger Car Sales 4,500 Higher than a Year Ago—New Low-Priced Models May Give March More than Seasonal Gain

DETROIT—February production of cars and trucks totaled between 115,000 and 120,000 according to estimates based on data available at this time. This represents a decline of about 10 per cent from January and compares with 123,000 in February of last year.

Unless recent complications in the banking field prove a serious bar to retail sales, March production is quite likely to show at least the usual seasonal increase over February of about 24 per cent. It may show considerably more than this increase if several rumored newcomers in the low-priced field actually make their appearance.

Reports on passenger car registrations in January from 34 states show a combined loss of nine per cent from last year in contrast with the small gain over 1932 indicated by the first few states to report. However, R. L. Polk & Co., which collects these figures, believes that there is an unusual lag in the figures this year and that the registration reports are probably 15 per cent under actual sales.

On the basis of the actual reports, registrations of new cars in January apparently totaled 80,000 against 87,500 last year. Ford registrations are estimated at 13,000 against 13,556; Chevrolet at 29,300 against 34,518 and Plymouth at 11,800 against 4801. Applying the Polk 15 per cent correction factor, the indications are that actual sales of new passenger cars in January were 92,000, a gain of 4,500 over last year. With the correction, Ford sales approximated 15,000, Chevrolet 33,700 and Plymouth 13,600.

Exide and Willard Show 1932 Profit

PHILADELPHIA — Electric Storage Battery Co. and Willard Storage Battery Co. for year ended Dec. 31, 1932, report net profit of $1,259,859 after expenses, charges and Federal taxes, against $2,770,457 in 1931.

Current assets at the year end were $23,111,101 and current liabilities were $821,890. Cash and marketable securities amounted to $16,190,882.

Gabriel Reduces Loss

CLEVELAND—Gabriel Co. reports net loss for 1932 of $107,938 against a deficit of $377,844 in 1931. Current assets, including $99,067 cash and marketable securities, amounted to $270,525 and current liabilities to $37,610, at the year end.

Eaton Earnings

CLEVELAND—Eaton Mfg. Co., formerly Eaton Axle & Spring Co., sustained a net loss after charges of $674,182 in 1932 against a net income of $243,471 in the preceding year.

Briggs & Stratton in Black

MILWAUKEE—A net income of $30,638 in 1932 is reported by Briggs & Stratton Corp., against $355,850 in 1931. On Dec. 31, current assets, including $1,627,431 cash and marketable securities, amounted to $1,969,343 against current liabilities of $160,628.

Norval Hawkins Joins Glen Buck Agency

CHICAGO — Norval A. Hawkins, for many years general sales manager of the Ford Motor Co. and later director of the Sales, Advertising and Service Section of General Motors, has joined the Glen Buck Co., advertising agency with offices in this city and

Norval A. Hawkins

Detroit, as vice-president. Mr. Hawkins' association with the Glen Buck Co. brings together two men who were employed by the Ford company during the days of its most spectacular expansion. At that time, Mr. Buck had charge of Ford publicity.

NE

Overland Resumes Truck Production

No Court O. K. on Balance of I. H. C. Order—Workers Organize on Wage Claims

TOLEDO—Five thousand Willys-Overland employes meeting tonight took steps to form an executive committee, secure legal aid, and prosecute their claims for two weeks' back wages amounting to about $300,000.

Lee W. Murlin, assistant United States attorney, representing Federal Judge Hahn, said that truck orders on hand would enable the plant to operate probably until May and urged that the plant be permitted to continue operations in best interests of creditors.

Several workers said they wanted pay before any more work is done and others urged picketing as a means of enforcing payment, but it is believed the workers as organized will cooperate in an orderly plan.

About 1000 workmen returned to the plant on Monday to complete the 568 I.H.C. trucks authorized by the court. They were met by some pickets bearing signs "We want our wages" and "Don't go to work until we get our wages." At meetings here earlier some Detroit Communists offered to provide leadership and advice to the Willys-Overland workers and were believed to be back of the movement to make trouble.

On Monday, also, Receivers Willys and Miller failed to obtain permission from the court to manufacture 4400 trucks for I.H.C. in addition to the 568 already authorized. Judge Hahn said he would not authorize the manufacture and sale of the trucks until he had proof that "the income will equal the outgo." He also set the requirements that wage scales would not be reduced below those prevailing at the time the receivership became effective and that assurance must be given that labor claims incurred in the venture will be paid. Employes have 30 days from Feb. 15 to file their claims. No mention was made of the receiver's plans in regard to passenger cars.

WS—

G.M. Employment in Fifth Monthly Gain

NEW YORK—General Motors Corporation announced Tuesday that the number of its employees in the United States increased 2,917 during January. This represented the fifth consecutive monthly gain.

Employment by General Motors increased 29,293 in the past five months. Although the increase for this five months' period reflected seasonal influences, it was larger than the increase for corresponding months of a year ago.

Motor Wheel Earnings

LANSING, MICH.—A net loss for 1932 of $181,479 after charges, etc., is reported by Motor Wheel Corp., against net loss in 1931 of $333,214.

Detroit Banking Situation Eases and Then Tightens as Difficulties Arise

Michigan Holiday Still Effective as Action by State Legislature is Awaited—Effect on Industry Serious if Moratorium Lasts Much Longer

DETROIT—Reopening of Michigan banks awaits action on part of state legislature permitting limitation of withdrawals by existing banks. With the Ford plan apparently rejected as the result of objections by large number of depositors in First National Bank, due mainly to Ford's intent to merge both Detroit institutions, the situation has reverted to conditions before Ford offer was made.

The present status of the R. F. C. loan is unknown and may have to be redetermined at time Michigan legislature enacts new laws.

DETROIT—As the Michigan bank "holiday" approached the end of its third week, definite assurance of bank reopening even on a partial payment basis was still lacking. In spite of the growing shortage of cash for industrial use, *Automotive Industries* has been unable to learn of any important cessation of production in plants contributing to automotive manufacture traceable directly to lack of quick funds to meet payrolls.

In some cases salary payrolls have only partially been met, pending the release of additional bank funds. Factory payrolls, however, in the majority of cases, seem to have been taken care of in cash when due. In a few cases salary rolls have been at least partially paid by checks, cashable when the banks reopen. In one or two cases, notably Mueller Brass Co. in Port Huron, and Dow Chemical Co. of Midland, Mich., "scrip" coined of metal products of these two companies have been issued for payrolls, and have been generally accepted by local merchants in lieu of cash.

Virtually all automobile manufacturers are operating with cash funds received from non-Michigan banks. Apparently only a small percentage of automotive industrial banking, generally, has been centered in Michigan at least recently. Other sources of funds have been in the form of receipts of cash and credit as the result of sales and payment of bills due outside of Michigan.

As a matter of fact, a greater part of Michigan's industrial areas, including Detroit, is today being financed by the automotive industry. If it had not been for automotive manufacturers' payrolls, the cash stringency situation would have been far more serious. Other industries have not been able to carry through in the same manner. Local merchants generally are even harder hit and in many cases are unable to take delivery of merchandise, lacking the necessary quick bank credit for payment.

Persistent refusal of Detroit banks to release any appreciable percentage of reserve deposits of Michigan outstate banks has created a more serious cash situation in smaller communities, offset on the other hand by ability of such communities to adopt limited "barter" and credit operations.

One of the anomalies of the Michigan banking situation is the rather remarkable way in which automobile sales through the state have held up. After a sudden drop during the first two to three days of the "holiday," automobile sales rapidly climbed, and in industrial centers have in some cases bettered sales in the second and third 10 days of February as compared with the first 10. The only explanation available is that where cash is available, individuals have become more inclined to use it for the purchase of tangible goods.

The possibility of course remains that failure of sufficient cash next month to meet payments may sharply increase the rate of repossessions.

Nevertheless, continuation of the banking "holiday" for another week or two would seriously disrupt industrial trades in the state.

Bank's Failure to Get N. Y. Loan Makes Ford's Control Uncertain

DETROIT—Business breathed somewhat more easily early this week when it was announced that Henry and Edsel Ford's entry into the banking field would make 35 per cent of the deposits in Michigan's two biggest banks available for withdrawal, instead of the meager five per cent limit in effect since the beginning of the Governor's holiday three weeks ago. As the week progressed, however, there was a noticeable increase in the tension.

Responsible for the reaction in part was the news that New York banks had refused to make the $20,000,000 loan on which a $54,000,000 loan from the R. F. C. to the First National, is reported to be contingent. In addition, some of the depositors of the First National were reported to be desirous of keeping it going, rather than have it go into receivership as the Ford plan contemplated. To avoid the receivership, they are making renewed efforts to raise the capital required for reorganization.

The Fords plan provided for rearing two new banks on the remains of the two which precipitated the trouble—the People's National Bank will succeed the First National and the Manufacturers' National Bank will replace the Guardian National Bank of Commerce. Subsequently, the Fords have indicated, the two banks may be merged.

All the capital stock in the new banks was purchased by the Fords in order to be free to carry out their own banking ideas. The policy of the bank according to Mr. Ford, Sr., would be to maintain liquidity and to foster the development of small industries in line with his well-known ideas on the desirability of decentralization.

No preferential treatment apparently was to be accorded by the new banks to out-state institutions which carried reserve accounts in the two old banks. Although it is understood that no such preference is pos-

(*Turn to page 293, please*)

Business in Brief

Written by the Guaranty Trust Co., New York, exclusively for Automotive Industries

There was no improvement in general business last week, although here and there a moderate betterment was reported. It is believed in some quarters that the ability of business to hold its own in the face of several unfavorable developments lately is noteworthy.

COMMODITY PRICES DROP

The Guaranty Trust Company's preliminary index of business activity for January was 55.0, as against 58.7 for the preceding month and 64.1 for a year ago. The company's index of wholesale commodity prices on February 15 was 33.0, as against 33.5 a month earlier and 41.4 two months earlier.

FREIGHT LOADINGS INCREASE

Railway freight loadings during the week ended February 18 totaled 514,390 cars, which marks an increase of 13,070 cars above those during the preceding week, but a decrease of 57,875 cars below those a year ago and a decrease of 198,766 cars below those two years ago.

RETAIL SALES DOWN

Department store sales in the Metropolitan area of New York during the first half of February, according to the Federal Reserve Bank of New York, were 22.2 per cent below those in the corresponding period last year.

FOOD PRICES

Retail food prices in the United States on January 15, according to the Bureau of Labor Statistics, showed an average decrease of 4 per cent, as compared with those a month earlier, and an average decrease of 13 per cent, as compared with those a year earlier.

EMPLOYMENT

According to a report of the Bureau of Labor Statistics, the level of employment in 17 industrial groups in the United States during the month of January declined 3.9 per cent, while total payrolls declined 5 per cent.

FISHER'S INDEX

Professor Fisher's index of wholesale commodity prices during the week ended February 25 stood at 55.1, as against 55.4 the week before and 55.3 two weeks before.

BANK DEBITS DOWN

Bank debits to individual accounts outside of New York City during the week ended February 21 were 12 per cent below those a year ago.

STOCK MARKET WEAK

The stock market last week suffered another bad break as a result of several unfavorable developments. The bond market was also weak. United States Government bonds and foreign government bonds participated in the decline. Railroad stocks were again the weakest feature of the list. Large and general net losses were registered for the week.

FEDERAL RESERVE

The consolidated statement of the Federal Reserve banks for the week ended February 21 showed increases of $41,000,000 in holdings of discounted bills, of $143,000,000 in holdings of bills bought in the open market, and of $25,000,000 in holdings of Government securities. The reserve ratio on February 21 was 61.2 per cent, as against 64.3 per cent a week earlier and 65.3 per cent two weeks earlier.

Federal Departments Ask for Export Data

Joint Committee Formed by State and Commerce to Expand Sales Abroad

WASHINGTON, D. C.—Functioning of a joint committee of officials of the Departments of State and Commerce to bring about promptly coordinated application of the best facilities of both departments in behalf of the harassed American exporter was announced today by Roy D. Chapin, Secretary of Commerce.

It is believed that through the committee the full resources of the two departments can be brought to bear with minimum delay, not only upon outstanding problems presented by business men but also in developing broad plans and policies destined to help the movement of American goods to foreign markets.

As a result of preliminary discussion the committee has already sent a questionnaire to leading industries in this country asking for full and frank replies as to the various aspects of export selling which these businesses consider of paramount importance. It is felt that the first-hand information thus secured will prove valuable in supplementing the wide range of data now available, and that it will permit the committee to decide upon a program which promises the most effective relief and assistance which may be within the power of the two departments to extend.

It is expected that very soon a complete tabulation of replies will be made available for the use of the joint committee. Later it is planned to institute further inquiries to cover the foreign trade of America more completely.

Perfect Circle Declares

HAGERSTOWN, IND.—The regular quarterly cash dividend of 50 cents a share on the 162,500 shares of common stock outstanding was declared on Feb. 16, 1933, by the board of directors of The Perfect Circle Co.

Graham Hold Gains

DETROIT—Retail deliveries of Graham sixes and eights for the week ending February 4, were the largest in 14 weeks, according to an announcement by Robert C. Graham, executive vice-president, Graham-Paige Motors Corp.

Canadian Output Rises in January

OTTAWA, ONT. — Production of 3,358 automobiles in Canada during the month of January marked an improvement of 36 per cent over the 2,139 cars built in December, but was 10 per cent under the 3,731 cars reported for January a year ago. The gain over the previous month was accounted for by the number of passenger cars increasing to 2,921 from 1,561, an advance which more than offset the decline in the number of trucks to 437 from 578.

Of this month's output 3,030 cars were made for sale in Canada, leaving a balance of 328 cars intended for export. The apparent consumption of cars during the month, as determined by adding the 3,030 cars made for sale in Canada to the 129 imported, amounted to 2,159 cars. Exports for January were reported at 504 cars.

British Austin Starts Canadian Sales Program

TORONTO—Austin Motor Car Co., Northfield, England, has taken steps for the establishment of a distributing organization in Canada for its full line of cars which has been accompanied by the shipment from England of a variety of models along with a complete line of parts for the agents at Halifax and Montreal. The latter have started out to appoint sub-dealers in their respective territories. At Toronto, the V. & S. Motors Limited has been appointed Austin distributor for the Province of Ontario and sub-agencies are being appointed in principal cities of the Province.

The Austin line has already made headway in the Pacific Province of British Columbia where there is a considerable homeland strain in the population, sales of the British car having been quite heavy. Austin agencies are to be appointed in Winnipeg for the Middle West and in St. John, N. B., thus providing rather complete sales and service coverage.

Link Belt 1932 Report

INDIANAPOLIS — Link-Belt Co. reports a net loss of $970,121 for the year ended Dec. 31, 1932, against a deficit of $638,974 in 1931. The company continues in a strong current position with quick assets of $12,220,266, including $2,741,878 cash and $5,705,892 in securities, against current liabilities of $615,348.

Claude B. Bailey

DETROIT—Claude B. Bailey, 54 years old, manager of the McCord Radiator plant at Wyandotte, Mich., for the past 18 years, died suddenly Friday of acute indigestion. He aided in the establishment of the Wyandotte plant and increased its employment from 30 to 400 men during his managership.

Black Quits Ford

DETROIT—Fred J. Black has resigned as advertising manager of the Ford Motor Co., ending a 15-year relationship. Mr. Black was the first business manager of the Dearborn Independent.

G.M.A.C. Profits Well-Maintained Despite 44.6 Per Cent Decrease in Gross Income

NEW YORK—In the face of a 44.6 per cent decline in volume, General Motors Acceptance Corp. reports for 1932 only a 30 per cent drop in net income from 1931. Comparative figures on the two years' operation, as revealed in President Schumann's annual report, follow:

	1932	1931
Net profit	$ 6,266,102	$ 8,979,120
Net profit from operations	4,282,102	8,483,119
Dividends from subsidiary General Exchange Ins. Co.	1,984,000	496,000
Volume—Gross	412,527,089	745,039,762
U. S. and Canada	387,645,294	678,225,299
Overseas	24,881,795	66,814,463
Short-term borrowings and discounts	33,320,672	142,769,754
Cash	43,949,507	55,427,863
Notes and Bills Receivable	131,710,511	244,550,673
Dealer Repossession Reserve	8,786,630	9,122,107
No. of branches	86	106
No. of employees	3,122	4,787

N. Y. Would Exempt First 4000 Miles

ALBANY, N. Y.—The first 4000 lbs. of truck weight will not be subject to the heavy surtaxes which become effective March 1, if a bill passed by the Lower House of the Legislature becomes law. The intention of the proposed exemption is to relieve farmers of the surtaxes, as many of their trucks weigh less than 4000 lbs., and hence would not be subjected to the surtax. The reduction in truck taxes resulting from the 4000-lb. exemption would amount to about $3,000,000, it is estimated.

Thermoid Loses $199,868

NEW YORK—A net loss of $199,868 after depreciation, interest and other charges, is reported by the Thermoid Co. and wholly owned subsidiaries, for year ended Dec. 31, 1932. This compares with a profit of $163,413 in 1931. Current assets of the year end were $1,865,604, of which $740,570 was cash and marketable securities. Current liabilities were $281,275.

Terraplane Eight Sets Three Records

Three records for stock cars having a piston displacement of from 183 to 305 cubic inches were established by Chet Miller driving a Terraplane Eight Sedan, immediately following Sir Malcolm Campbell's all time speed record, at Daytona Beach.

From a standing start Miller set a record for one mile in 67.969 miles per hour, the previous record of any closed car of any class being 66.78 miles per hour; previous in Terraplane class was 58.47 miles per hour. In a flying start, Miller established a record of 85.836 miles per hour over a mile, breaking all previous records for its class. The third record was made in second gear with flying start at 62.521 miles per hour; previous second gear record for Terraplane class was 51.66 miles per hour.

Ford Fours $50 Lower

DETROIT—The Ford Motor Co. announces that prices on its new 112-in. wheelbase car with four-cylinder engine, are $50 lower than on the corresponding eight-cylinder models.

Plymouth Quickens Pace in February

DETROIT—Production at Plymouth was materially increased during the last half of February and unfilled orders on hand indicate that March will see a still greater increase, according to a statement by H. G. Moock, general sales manager.

Shipments of new Plymouth sixes to Dodge, DeSoto and Chrysler dealers throughout the United States the last 14 days in February were 186 per cent of shipments made the first half of the month. Total shipments during the entire month of February were 358 per cent of shipments the same month a year ago.

Plymouth retail deliveries have shown a week-to-week increase over corresponding periods a year ago since the week ending November 12, the aggregate increase being 124.5 per cent of the total for the same 13-week period in 1931 and 1932.

Financial Tension Eases as Fords Buy All Stock in Detroit's Biggest Banks

(Continued from page 291)

sible legally, the governor still is working to release these deposits. About $20,000,000 is reported to be involved.

Meanwhile, three Detroit banks—the Detroit Savings, the United Savings and the Commonwealth Commercial State—are permitting full withdrawals on commercial accounts and limited withdrawals for necessities on savings deposits. Withdrawals from these banks are said not to be heavy.

The placing of the 35 per cent withdrawal limit on deposits was made possible by the quick passage of the Couzens amendment to the national banking law. This amendment makes it legal for the Comptroller of the Currency to exercise the same authority on national banks as is held by state officials in respect to state banks. The effect of this revision in the law was to permit Detroit's two big nationals to take advantage of the partial moratorium created by the governor.

As reported last week, the original effort to reorganize the two big banks involved R.F.C. loans of $100,000,000 to the First National and $35,000,000 to the Guardian. The Comptroller of the Currency required a capital of $7,500,000 for the former reorganization and of $3,500,000 for the latter, a total of $11,000,000.

Despite subscriptions by General Motors, Chrysler and other large interests, it was found impossible to raise the $11,000,000 without Mr. Ford's assistance, which he refused to give. Reasons given for this refusal are that he wanted to maintain his position among the depositors and because he felt that as one of many stockholders he would be unable to have the management carry out his ideas on banking, some of which are described as revolutionary. The impasse was ended by the Ford offer to subscribe the entire capital stock. Meanwhile the R.F.C. decided to reduce its loans to $54,000,000 and $24,000,000, respectively. This in turn reduced the capital requirements to $5,225,000 and $2,625,000, which are the amounts subscribed by the Fords.

As a result, Michigan's two biggest banks are now controlled 100 per cent by Henry and Edsel Ford. Naturally, their directorate will function in sympathy with Mr. Ford's ideas on banking.

A complication was introduced into the situation Tuesday when it was learned that a $20,000,000 loan from New York banks had been held up because of legal difficulties. It was said that this loan was part of the agreement with the R.F.C., under which it would lend $54,000,000 to the First National to facilitate the liquidation of its deposits. The Fords are reported, however, to be going ahead with their plans.

White - United Plan Blocked By Minority

Revisions in Merger Terms Expected to Meet Objections

CLEVELAND — A. R. Erskine, Chairman of the Board, announces that the Directors of The White Motor Company at a special meeting held in Cleveland February 23rd inst. withdrew the plan of consolidation of The White Motor Company and United Truck Corporation, a wholly owned Studebaker subsidiary which it was previously expected would be ratified by White stockholders.

Mr. Erskine stated that through the United Truck Corporation Studebaker owns over 95 per cent of the White stock, and that the plan of consolidation between the White Company and United Truck was for the purpose of consolidating the Studebaker and White interests which are now identical in a practical, if not a legal, sense, with regard to all of the former stockholders, except a minority.

Mr. Erskine stated that one of the minority stockholders had objected to the consolidation plan and had threatened to tie it up by litigation which might extend over a considerable period. Accordingly, the directors on advice of counsel decided to withdraw the plan to permit modification.

T. R. Dahl, Director and Vice President of the White Motor Company, also denied reports published to the effect that he had opposed the merger. Mr. Dahl's statement follows: "Speaking for A. G. Bean, President of The White Motor Company, and myself, at no time have we opposed in any way the proposed merger between The White Motor Company and the United Truck Corporation.

"At the meeting held in Cleveland February 23rd minority stockholders threatened litigation which might have extended over a long period, and for that reason it was decided to postpone the proposed merger until such a time as attorneys could decide the best way to handle it. It was purely a legal matter, one for only attorneys to decide and not the directors of The White Motor Company.

"It would be foolish to assume that the directors of White would offer any objection to the merger plan with the United Truck when the Studebaker Corporation owns 95 per cent of the White Motor stock. The Studebaker Corporation owns The White Motor Company and could do what they pleased."

Federal Reserve Business Indexes

(1923-1925=100)

	Industrial Production	Automobile Production	Automotive Employment	Automotive Payrolls
Jan., 1933	64*	43*	53	36
Dec., 1932	66	60	52	32
Jan., 1932	72	45	67	48

*Preliminary.
All indexes except payrolls adjusted for seasonal.

Automotive Steel Takings Decline

Steel Makers Continue Effort to Keep Sheets at Present Price Level

NEW YORK—To a slight dip in automotive takings of steel is ascribed a mild recession this week in the rate of rolling mills operations. Cleveland district mills which a few weeks ago led all other districts in point of activity are more so affected than Mahoning Valley, Pittsburgh and Chicago district mills.

There has been so much seesawing in steel mill operations of late that this development can not be interpreted as indicating a definite trend. Ford releases are reported to be coming through, but tonnages involved are hardly up to expectations.

Impending changes in the set-up of the sheet market continue in the foreground of market discussion. It is generally thought that a formal announcement by one or the other producer will shortly make its appearance. This, however, will by no means accomplish of itself its purpose of stiffening the sheet market. With price competition in the passenger car field as intense as it is, strong resistance to any advances must be looked for and the more conservative element in the market looks for nothing more for the present than that sheet prices can be stopped from slipping further.

Makers of cold-finished steel bars fared better in February than in the preceding month, although following declaration of the Michigan bank holiday specifications began to taper off. Bolt and nut makers report that, following a considerable amount of covering by automotive consumers earlier in the year, demand has turned quiet. Automotive alloy steel specialists report light, but consistently steady demand.

Pig Iron—While virtually all pig iron buying by automotive foundries is in carloads, a fair volume of orders of this sort is in evidence in all markets. The tone of the market continues easy with quotations nominally unchanged.

Aluminum—Secondary aluminum smelters in Cleveland entertain high hopes that once Ford production gets under full headway demand for remelted aluminum from parts makers will expand considerably. Better aluminum demand in March is confidently looked forward to generally. Quotably the market remains unaltered.

Copper—The market remains at the 5c level with business very light.

Tin—Spot Straits tin was quoted at 23.20c at the opening of the week. Although a few consumers are in the market, most of the trading is professional in character.

Lead—Quiet and unchanged.

Zinc—Joplin ore sellers are supporting the zinc market by restricting sales to smelters. As a result the market is a shade higher.

Exports, Imports and Reimports of the Automotive Industry for January, 1933-1932

	JANUARY 1933 Number	1933 Value	1932 Number	1932 Value
Automobiles, parts and accessories	....	$6,539,341	....	$6,764,524
Motor trucks, buses and chassis (total)	3,084	1,155,917	2,515	1,141,297
Under one ton	341	79,978	347	89,591
One and up to 1½ tons	2,527	888,378	1,992	797,111
Over 1½ tons to 2½ tons	148	116,864	113	128,797
Over 2½ tons	44	62,502	47	92,549
PASSENGER CARS				
Passenger cars and chassis	7,059	3,148,343	4,474	2,427,466
Low price range $850 inclusive	6,629	2,668,899	3,877	1,772,204
Medium price range over $850 to $1,200	262	249,966	405	385,942
$1,200 to $2,000	100	137,524	75	102,144
Over $2,000	35	81,762	56	143,669
PARTS, ETC. Parts Except Engines and Tires				
Automobile unit assemblies	....	1,006,736	....	1,479,551
Automobile parts for replacement (n. e. s.)	....	792,133	....	1,077,312
Automobile accessories	....	123,506	....	164,350
Automobile service appliances (n. e. s)	....	83,844	....	113,399
Airplanes, seaplanes, and other aircraft	55	601,637	8	116,853
Parts of airplanes, except engines and tires	....	99,995	....	59,133
INTERNAL COMBUSTION ENGINES Stationary and Portable				
Diesel and Semi-Diesel	1	5,440	4	37,303
Other stationary and portable				
Not over 10 h.p.	233	15,431	303	22,132
Over 10 h.p.	54	17,031	41	66,832
Automobile engines for:				
Motor trucks and buses	114	26,257	291	36,342
Passenger cars	751	66,382	1,306	121,134
Aircraft	574	85,400	14	18.678
Accessories and parts (carburetors)	....	71,288	....	115,038
IMPORTS				
Automobile and chassis (dutiable)	1	253	34	41,279
Other vehicles and parts for them (dutiable)		2,794	....	74,299

Shaler Earns $6,184

MILWAUKEE—Shaler Co. reports net income in 1932 of $6,184 against $3,302 in the previous year.

Hennecke Heads New Equipment Company

Automotive Equipment, Inc., a new corporation, headed by Earle V. Hennecke, which will manufacture and market a new line of turnover products for automotive resale has just been organized. No announcement has yet been made as to the specific items in the line though it has been hinted that the products are the result of long study and market research by the engineer associates of the company.

Mr. Hennecke was at one time head of the MotoMeter Co. and was active in trade association work having been both chairman of the board and president of the Automotive Equipment Association and a director of the Motor & Equipment Association.

Hudson-Essex Price Changes

Hudson

MAJOR	Old	New	Down
Sedan	$1395	$1250	$145
Brougham	1495	1350	145
Club Sedan	1495	1350	145
7-p. Sedan	1495	1350	145
EIGHT			
Coach	1075	975	100
Coupe	1095	995	100
Sedan	1145	1045	100
Conv. Coupe	1245	1145	100
SIX			
Bus. Coupe	765	695	70
Coach	795	695	100
Coupe	815	735	80
Sedan	865	765	100
Conv. Coupe	915	845	70
Phaeton	835	765	70

Essex Terraplane

SIX			
Roadster	425	Same	None
Bus. Coupe	495	485	10
Coach	515	505	10
2-4-p. Coupe	545	535	10
Sedan	565	555	10
Spec. Roadster	525	Same	None
Spec. Coach	555	545	10
Spec. Coupe	580	570	10
Sedan	605	595	10
Conv. Coupe	605	595	10
Phaeton	...	515	..
EIGHT			
Bus. Coupe	645	615	30
Coach	650	615	35
Coupe	685	655	30
Sedan	725	675	50
Conv. Coupe	725	695	30
2-p. Roadster	None	565	New
4-p. Roadster	None	625	New

The new price list reveals that two models are being added to the Terraplane eight line, a two-passenger roadster at $565 and a four-passenger roadster at $625. The two-passenger roadster gives the Terraplane eight the lowest base list price of any straight eight passenger car on the market.

Forecast Small Drop In Motor Fuel Demand

NEW YORK—Domestic motor fuel demand in the first half of 1933 will be 4.8 per cent, or 15,250,000 bbl., under the same period in 1932, according to estimates made by the American Petroleum Institute. Export demand is estimated for the first six months at 31.4 per cent under last year. The combined estimated decrease amounts to 7.6 per cent.

Wayne County Sales

DETROIT—Registrations of new cars in Wayne County for the short month of February totaled 2045 passenger and 102 commercial cars. This represents a decrease of only 14 per cent in passenger cars registered from January and a decrease of 20 per cent under last February—a creditable showing in view of the banking situation. Commercial registrations showed a greater drop of 30 per cent under January and 50 per cent under last February.

Fred B. Sides

DETROIT—Fred B. Sides, export manager of Hupp Motor Co. died Tuesday in Florida. Funeral services held in Detroit, Friday. Had been with Hupp 19 years and in charge export business for six years. He was 54.

L. A. Young Reports

DETROIT—L. A. Young Spring & Wire Corp. and subsidiaries show a 1932 net loss after depreciation, interest, etc., of $196,223, as compared with a net profit in 1932 of $521,738.

Liebold Clears Mystery

DETROIT — Mystery surrounding the sudden disappearance on Monday of Ernest G. Liebold, confidential secretary to Henry Ford, were cleared up late Tuesday when he "found himself" in a Traverse City, Mich., hotel. Partial lapse of memory occasioned by overwork in connection with the recent banking crisis, was the reason for the episode.

Wilcox-Rich Earns Profit

CLEVELAND—Wilcox-Rich Corp. earned $112,779 after charges in 1932 as compared with $394,376 in the previous year. Current assets at the year end included $27,650 cash, $1,314,677 in U. S. bonds and $128,780 in other securities, and amounted to $2,051,545 against current liabilities of $162,435.

B.S.A. Reports Loss

LANCASTER, PA.—Bearings Co. of America reports a net loss after depreciation of $122,252 for 1932 as compared with a loss of $125,244 in 1931.

Evans Products Report

DETROIT—Evans Products Co. has reported net loss for the year ended Dec. 31, 1932, of $250,943 after all charges, compared with loss of $79,828 in 1931. This loss includes a charge-off amounting to $108,706 for abandoned cut-over land and timber and development expenses on the autoloader during the year. At the same time bonded indebtedness has been reduced to $119,000.

Perfect Circle Profit

HAGERSTOWN, MD. — Perfect Circle Co. reports net profit of $252,962 after charges, depreciation and federal taxes for 1932. This compares with $901,831 in 1931.

Current assets as of December 31, 1932, including $1,090,990 in cash and marketable securities, amounted to $2,182,513 and current liabilities were $208,936.

Motor Stocks Decline

NEW YORK—The market value of seven motor stocks listed on the New York Stock Exchange declined 26.8 per cent in January, as compared with an average drop of 19.3 per cent for a group of 100 representative stocks, according to Frazier, Jelke & Co.

Kelly-Springfield Deficit

NEW YORK—Report of Kelly-Springfield Tire Co., including predecessor company for year ended December 31, 1932, shows net loss of $666,313 after charges. This compares with net loss in 1931, of $468,334.

Current assets as of December 31, 1932, including $919,624 cash, amounted to $7,412,488 and current liabilities were $408,463. The company has no bank indebtedness.

New Class C (183-303 Cu. In.) Set by Terraplane Eight

Distance	*Start*	*Old Record*	*New Record*
1 Km.	Standing	50.3260 m.p.h.	61.614 m.p.h.
1 Mi.	Standing	55.3760 m.p.h.	67.969 m.p.h.
1 Km.	Flying	69.503 m.p.h.	85.771 m.p.h.
5 Km.	Flying	68.6934 m.p.h.	85.791 m.p.h.
5 Mi.	Flying	69.8423 m.p.h.	85.431 m.p.h.
10 Km.	Flying	Not listed	85.448 m.p.h.

Terraplane Eight piston displacement is 243.9 cu. in.

Accidents Caused by Car Defects Decline

View That Aging Cars Add to Hazard Not Borne Out by Connecticut Accidents

HARTFORD, CONN.—Despite all the "viewing with alarm" of the hazards created by the increasing number of old automobiles on the highways, Connecticut accident statistics attribute a smaller proportion of accidents to defective equipment in 1932 than in 1931. In the latter year 3.5 per cent of the State's 13,268 highway accidents were charged to defective equipment while in 1932 only 3.2 per cent of the 10,971 were attributed to that cause. In actual numbers, accidents blamed on defective equipment declined from 289 in 1931 to 204 in 1932.

Fatal accidents showed a similar decline, the respective figures being 211 and 176, representing 16 and 11 per cent of fatalities respectively.

Recklessness and failure of operators and pedestrians, continue to account for an overwhelming majority of highway accidents, as they have since this State has kept statistics of this kind.

Particular importance is attached to the Connecticut statistics on highway accidents because this State has been making detailed analyses of the situation for more years probably than any other state and hence has more experience in the work. Moreover, the detailed breakdown of causes and circumstances provides the data really needed for an intelligent study of the accident problem.

World Oil Congress to Be Held in London

LONDON (By Mail)—A world petroleum congress, organized by the Institution of Petroleum Technologists, will be held in this city July 20-25. Meetings will be held at the Imperial College of Science and Technology, South Kensington. The congress will comprise geological, engineering, refining and chemical, and standardization sections, and meetings of the different sections will be held simultaneously. Among the papers on the program some deal with the knock rating of motor and aviation spirit, fuels for high-speed Diesel engines, and the knock-rating of Diesel fuels.

Mack Curtails Loss Despite Lower Sales

Current Ratio Is 17½ to 1—Cash and U. S. Bonds Exceed 9 Million

NEW YORK—As a consequence of a decline in net sales from $25,131,010 in 1931 to $13,217,991 last year, Mack Trucks, Inc., reports a net loss for 1932 of $1,479,598, not including a special reserve account of $1,000,000 against possible loss on receivables and inventories. In the preceding year, the company's net loss was $3,032,410.

Current assets at the year end amounted to $29,204,680, including $9,767,786 cash and United States securities, as compared with current liabilities of $1,666,784. Depreciation in 1932 amounted to $617,226 as compared with $1,494,177 in 1931, the difference being due to the policy of making depreciation dependent on production and to the write-down of tools to $1 in 1931.

National Aviation Reports

NEW YORK—National Aviation Corp. reports a net loss of $115,622 for the year ended Dec. 31, 1932, against $827,955 in 1931.

Purchasing Power Off 48 Per Cent From 1929

NEW YORK—The national income in 1932 was 48 per cent less in purchasing power and 53 per cent less in dollars than in 1929, according to preliminary estimates for last year made by the National Industrial Conference Board. Comparative figures for the last four years follow:

	Income in Dollars	Income Adjusted to 1913 Dollars
1929..	$85,200,000,000	$53,100,000,000
1930..	70,700,000,000	45,800,000,000
1931..	52,700,000,000	37,900,000,000
1932..	40,000,000,000	28,800,000,000

De Soto "Factories" Go Touring Again

DETROIT—Following a year's tour of the United States during which it was viewed by more than three million people, the $20,000 working model of the De Soto automobile factory left Detroit today on another extended tour. At the same time, a duplicate of the model, also built at a cost of $20,000, was on its way to another section of the country.

Accompanying one of the models is Peter De Paolo while Tony Gulotta accompanies the other.

Plymouth Donates Motors to Schools

DETROIT—Plymouth Motor Corporation delivered new Plymouth Six engines in operating condition to the Lawrence Institute of Technology of Highland Park, Mich., and to the University of Wisconsin during the past week, it is announced. The engines were donated to the automotive departments of these institutions for study and technical purposes.

New Expander for Plymouth Piston

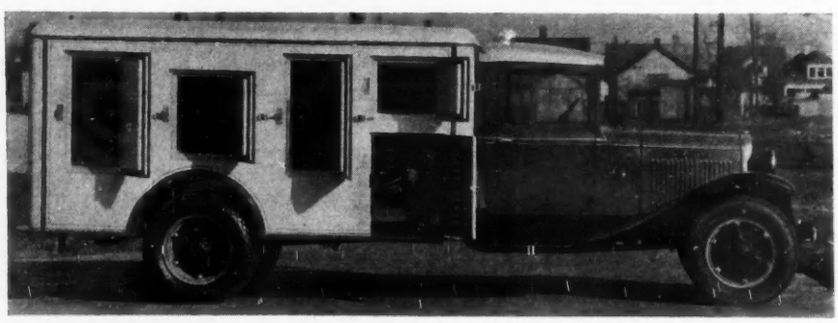
HAGERSTOWN, IND.—The Perfect Circle Co., manufacturer of Perfect Circle Piston Rings, have announced a new piston expander for the Plymouth 4 cylinder automobile.

The new expander is essentially the same design as the expander announced for model A Ford several months ago.

Willys Cars Have Chain Front-End Drive

The new Willys Four and the Willys Six cars have front-end drives by Link-Belt silent chains, and the statement in our article on design trends in the issue of Dec. 24 that the Four had a metal gear drive was incorrect.

Magnesium Alloy Body



New magnesium alloy (Dowmetal) refrigerator body with a capacity of 500 gal. of ice cream. The body weighs approximately 2000 lb. and is equipped with a mechanical refrigerating unit driven by a small gasoline engine. The body is mounted on a Dodge two-ton chassis

N. S. P. A. in Repair Financing Tie-Up

Company With 300 Branches Will Take Loans Secured by Car Owner's Furniture

DETROIT—In line with the steadily growing popularity of the deferred payment plan as applied to automotive service work, the National Standard Parts Association, which organization has sponsored the idea during the past three years, has announced the formation of a working arrangement with a finance company operating more than 300 branches.

This arrangement with the Beneficial Industrial Loan Corp. and its subsidiaries such as Personal Finance Co., Inc., and Industrial Bankers, Inc., supplements the many previous connections made with independent local finance companies for wholesalers offering the finance service to their customers according to the plan developed by the N. S. P. A.

The Beneficial Industrial Loan Corp. operates under the small loan acts of the various states and loans are made for repairing automobiles without regard for their age. Security for the loans of this company is in the form of a mortgage on household furniture. This practice varies from the usual one of taking the title to the car as security, in which case cars more than three years old are not ordinarily acceptable to the finance companies.

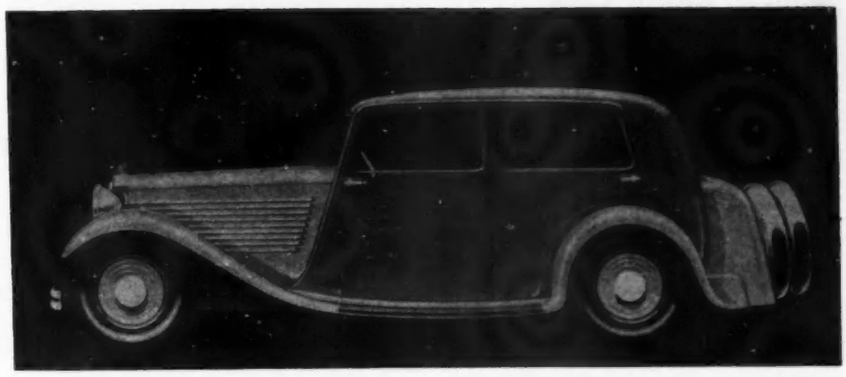
"How to Sell Service on Deferred Payments" is the title of a booklet published by the National Standard Parts Association and offered, free of charge, to wholesalers and service men. It is the only treatise on the subject available and covers in unbiased detail the entire plan. Requests for the booklet may be made through this publication or direct to N. S. P. A., Eaton Tower, Detroit.

Shifts in Auto-Lite Holdings Disclosed

NEW YORK—New $5 par common of the Electric Auto-Lite Co. has been listed by the New York Stock Exchange. In the application for this listing, it was revealed that Auto-Lite had disposed of 75 per cent of its holdings in Electric Auto-Lite of Delaware, Inc., a holding company which at one time held about 140,000 shares of Bendix Aviation. Auto-Lite acquired an 80 per cent interest in the Delaware holding company in 1929 together with a special $4,000,000 cash dividend in connection with the sale of Eclipse Machine Co. to Bendix Aviation.

The application also disclosed that Auto-Lite has disposed of its holdings in John W. Brown Mfg. Co. and in the Fostoria Machine & Tool Co. Since July 31, 1929, Auto-Lite has acquired 65,541 class A common shares of Corcoran-Brown Lamp Co. and has acquired entire capital stock of Southwest Battery Corp. through its subsidiary U.S.L. Battery Corp.; of Concealed Check Co. through its subsidiary Prest-O-Lite Storage Battery Corp. and of Earhart Door Check Co. directly.

Mathis 8 Hp. Model for 1933



New Mathis 8 hp. four-cylinder Emyquatre 1933 model. It is equipped with a four-speed transmission

Continental Output Expanding Steadily

Company Now Has 1200 Outlets, Krohn Says

DETROIT—Continental Automobile Company's production by the end of February will reach the highest point since the company began manufacturing operations in December.

Distributor accounts established to date total more than 200. Retail outlets, according to General Sales Manager Krohn, will swell the total of Continental dealer forces to approximately 1200.

"Whereas dealers have received only the lowest priced four-cylinder Beacon models prior to the first week of February," Mr. Krohn said, "deliveries of the six-cylinder Flyer now are being made. Shipments of the larger Ace models are scheduled for March 1, a date that may be anticipated."

Fords Accept Subpoenas

DETROIT—Henry and Edsel Ford have voluntarily accepted the new subpoenas in the six-year-old legal action of the Sweeten Automobile Co. of Philadelphia against the Ford Motor Co.

Toledo S. P. Sales Up

TOLEDO—Toledo Steel Products Co. reports 14 per cent increase in dollar volume of sales for last six months 1932 over same period previous year. Unit sales of valves show much greater gain.

Dodge Holds Gains

DETROIT — Dodge dealers' sales for 12 consecutive weeks ending Feb. 11 were 43.2 per cent ahead of the corresponding 1931-32 period. Sales this year to date exceeded sales in the same 1932 period by 41.7 per cent.

Church With Winton

CLEVELAND—Effective Feb. 15, Winton Engine Corp. announces the appointment of H. D. Church as vice-president in charge of engineering and manufacturing. Mr. Church was for many years vice-president of the White Motor Co.

Continental Entertains

DETROIT — Continental Motors Corp. and its subsidiaries entertained more than 1000 employees and their wives Wednesday evening at a banquet in the Masonic Temple. A similar dinner and meeting was held a week ago in Muskegon for employees of the company's plants there.

British and Canadian Overland Not Involved

TORONTO, ONT.—"Willys - Overland, Limited, of West Toronto, and Willys - Overland - Crossley, Limited, of Stockport, England, are not included in the receivership which has been asked for the Willys-Overland Company of Toledo, Ohio," T. A. Russell, president of the Canadian and English organizations, said when informed of the action taken at Toledo.

"The Canadian and English companies are separate organizations, and their financial arrangements are entirely separate from those of the American company," Mr. Russell stated, "so there is no receivership contemplated for the Canadian company."

Urges One National Show in Motor City

Detroit Convention Bureau Lists Reasons for Change

DETROIT—The idea of holding one national automobile show here, to replace the traditional New York and Chicago exhibits, has been endorsed by the Detroit Convention and Tourist Bureau. It lists reasons for the change as follows:

The original purpose of the National Show no longer exists because of the change of dealer and distributing organizations; and because it is no longer necessary to meet European competition.

The cost of sending personnel and cars to New York and Chicago is staggering.

Production schedules are seriously retarded.

Paid admissions to the New York show are declining sharply.

The first 10 days in January is the zero point of New York's transient population.

The four floors of the Grand Central Palace offer inadequate floor space.

Habit is a poor reason for continuing the show in New York.

Michigan is the capital of the automobile industry, and the most critical and automobile-wise audience in the world is found in Detroit.

One National Show in Detroit would eliminate the expense of other shows and would be all that is necessary.

Dealers could combine a visit to the show and to their home plants.

Detroit's entertainment opportunities are excellent.

Detroit is happily situated geographically.

Detroit has greater show space than either New York or Chicago, and 200,000 square feet of it is on the first floor.

Detroit offers dining facilities for 2500 guests at one banquet.

There are 25,000 first-class hotel rooms in Detroit.

Publicity value of the show would be greater if held in Detroit.

A trial of one year, 1934, should be given Detroit.

Stewart Radio Has New Automobile Set

The new Stewart "Companion," an all-electric superheterodyne auto radio manufactured by the Stewart Radio and Television Co. of this city, introduces, for the first time, Floating Tone Control (patent applied for), an exclusive feature said to utilize full acoustic properties of the car itself. List price, complete ready to install, $44.50. The Stewart Aristocrat, the larger model, listing at $59.50, is the de luxe set.

CALENDAR OF COMING EVENTS

Am. Society Testing Materials, New York ..... Mar. 8

National Machine Tool Builders Assoc. Annual Meeting, Cleveland, ... April 24-25

U. S. Chamber of Commerce Meeting, Washington, D. C. ..... May 2-5

American Society for Testing Materials, Chicago ..... June 26-30

National Metal Congress, Detroit ..... Oct. 2-6

Motor Stock Values Exceed a Billion

NEW YORK—The market value of all automotive stocks listed on the New York Stock Exchange was $1,073,569,660 on Feb. 1, 1933, according to the New York Stock Exchange. The market value of listed stocks of automobile and truck manufacturing companies on that date was $938,700,887, and of automobile accessory manufacturing companies $134,868,773. Total value of automotive common stocks was $921,604,433 and of preferred stock $151,965,227.

Bower Reports Black Figures

DETROIT—Bower Roller Bearing Company has reported for year ended Dec. 31, net profit of $159,157, after charges and Federal taxes, equal to 67 cents a share on 239,000 no par shares. This compares with net profit of $231,190, or 96 cents a share on 239,701 shares in 1931.

Current assets as of Dec. 31 totaled $893,985 and current liabilities $124,521, against $880,863 and $160,291, respectively, at the end of 1931.

At the annual meeting, stockholders voted to change capital stock to $5 par from no par. Directors and officers were reelected.

I. H. C. Reduces Dividend

CHICAGO—Directors of International Harvester Company have voted a dividend of fifteen cents on common stock, reducing the rate from 30 cents a share paid in the previous quarter. A year ago the rate was reduced to $1.80 from $2.50. The present dividend is payable April 15 to stockholders of record March 20.

License Granted on "Alumilite" Process

Consolidated Stamping Gets Rights on Anodic Treatment of Aluminum

DETROIT—Exclusive license has been granted the Consolidated Stamping Company, 2753 West Fort Street, Detroit, by Aluminum Colors, Inc., of Indianapolis for the anodic treating of all types of aluminum castings, stampings, strips and sheets, under its process, which is claimed to make aluminum highly resistant to all kinds of corrosive action.

A feature of the process, is that in addition to the colorless normal sheen which it imparts to the surface treated, aniline dyes can be added to the electrolytic bath, permitting their finish to a high lustre in a large variety of colors, including jet black, green, blue, yellow, red, etc.

It is claimed that these finishes are many times more resistant to abrasion or corrosion than enamel or other common metal finishes. The process employs the principle of electrolytic oxidation—a form of plating—which is not really a coating but an actual fusion with the metal, becoming an integral part thereof. Either in the natural finish resulting from the colorless anodic bath, or when aniline dyes are added, the surface is claimed to be proof against chipping, cracking, regardless of strain, stretching, or bending.

The process already has a widespread use in non-automotive fields, especially in the electric refrigerator industry, and the Consolidated Stamping Company has installed complete "alumilite" equipment to handle jobbing and manufacturing contracts for manufacturers for the State of Michigan.

Noblitt-Sparks Earnings

CHICAGO—Despite a deficit of $395,113 in the first quarter of last year, due chiefly to cost of retooling and inventory adjustments, Noblitt-Sparks Industries, Inc., finished the year with an operating profit of $12,294 and a net loss after depreciation of $85,575. This compares with a deficit of $100,334 in 1931.

The company's balance sheet as of Dec. 31 last shows current assets of $631,205 and current liabilities of only $49,462, compared with $701,652 and $79,809 respectively at the end of the preceding year.

Parker Rustproof Earnings

DETROIT—Parker Rust-Proof Co. had a net profit in 1932 of $264,736, after charges, equivalent, after preferred dividends, to $2.61 a share on the common. In 1931, the company earned $449,070, equal to $4.48 per common share.

Magnetically Actuated Spray Valves Meter Fuel

(Continued from page 282)

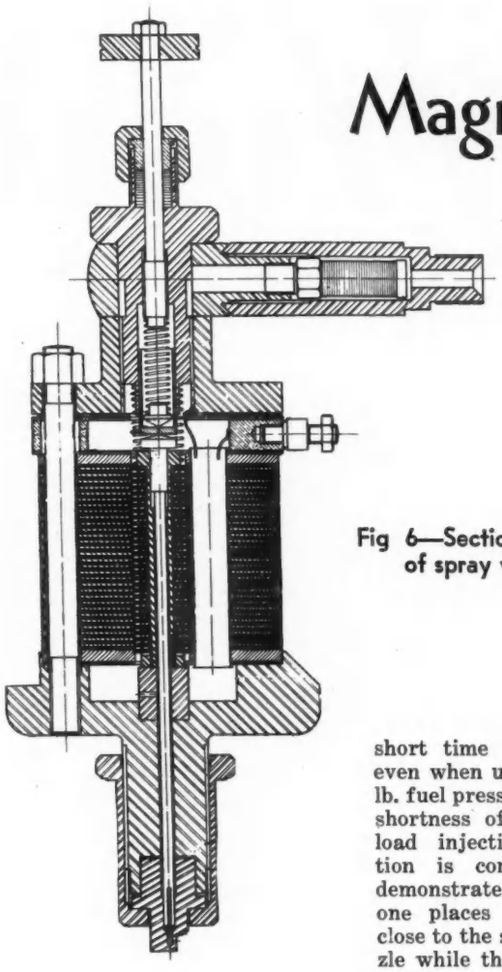


Fig 6—Sectional view of spray valve

short time available, even when using 4000 lb. fuel pressure. The shortness of the full load injection duration is convincingly demonstrated when one places his hand close to the spray nozzle while the valve is injecting by means of a condenser discharge into the open air. Only a relatively gentle puff is felt. Yet were the valve held wide open for a few seconds by connecting a battery directly across it, the spray penetration would be sufficient to cut the flesh. This is explainable by the fact that the duration of opening is so short that it is fully completed before the fuel jet has time to become accelerated to the velocity normally accompanying 4000-lb. pressure.

The spray valve body or housing is made of alternate layers of iron and non-magnetic material, held together between end plates by eight studs. Four coils of seven turns each are threaded through holes drilled in the laminations, and a central hole encases the armature.

The upper end is closed by the fuel connection ring, through which passes a screw for adjusting the spring tension. This adjustment is principally for experimental purposes, and is thought to be unnecessary in regular production models.

The magnetic action of this valve is made clear by Fig. 5. Case A shows the relative positions of the armature (plunger) and field laminations when the valve is closed. The magnetic lines of force resulting from a flow of current are seen to be highly concentrated in the region of overlap between the layers of iron. The tendency is for these lines to shorten themselves and straighten out, and as a result there is a powerful pull on the plunger. As the plunger moves upward, the overlap of the magnetic laminations becomes greater, the lines of force become straighter, and the lift becomes less, until the conditions in Case B are reached. Here there is no force acting on the plunger and it "floats" in the magnetic field. In the system used here, the magnetic pull is greatest when the valve is closed, which is exactly the instant when a large force is most needed to overcome the hydraulic pressure on the top of the plunger, and to rapidly accelerate it upward.

To stop the travel of the plunger when it has reached its uppermost position, and immediately start it on its downward travel by spring force, necessitates that the magnetic flux collapse very rapidly after it has reached its maximum. Herein lies the value of the condenser as a means of energizing the valve. The heavy electrical charge stored in the condenser persists for only an instant after it has been released to the windings of the spray valve. The flow of current is very large while it lasts, because the low resistance and low inductance (i.e., electrical inertia) of the windings constitute virtually a short circuit. Thus a full charge of the condenser is completely dissipated in about 0.001 sec.

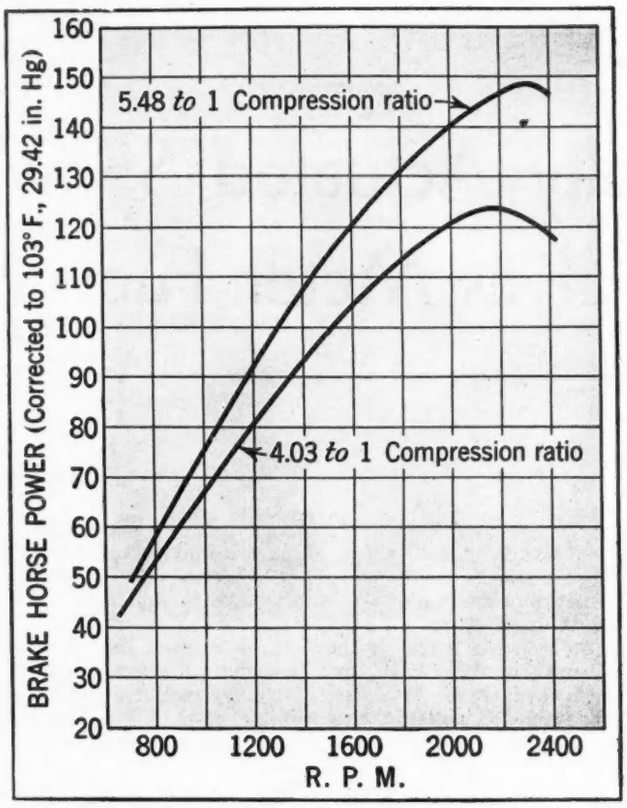
The condenser is of the electroyltic dry type, which has the advantage that a large capacity can be obtained in small dimensions, and that if punctured it heals itself instantly. On the experimental engines the system is operating at 24 volts (d.c.).

To start the engine cold on Diesel fuel, it is simply necessary to furnish the ignition arc at cranking speeds. This can be accomplished by overexciting the alternator field by means of a supplementary winding connected only when the starter is used, or by driving the generator through an overrunning clutch and allowing the charging generator to "motor" it.

The transformer is of the single-phase type and is similar to those used in connection with neon signs. On the experimental engine a simple carbon-pile rheostat is used for throttling, with a supplementary rheostat of the same type for control at idling speeds. Both are operated by hand wheels.

The fuel injection system is of the constant-pressure type, the pressure being maintained at 4000 lb. per sq. in. by a small plunger pump in which the plunger is lapped in the barrel. To this pump, fuel is supplied by a pump of the type used for fuel feed on automobiles. As accumulator or ram dampens out pressure impulses.

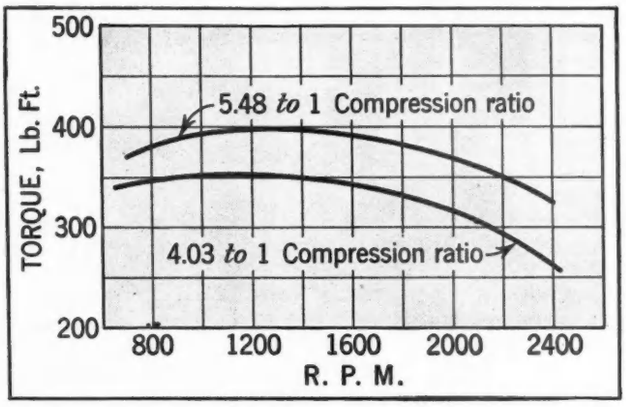
Regulation of the pressure on the fuel also is effected by electrical means. A diaphragm regulator is provided on the fuel line, and when the pressure reaches the desired valve, this diaphragm closes a pair of electrical contacts, thereby closing the circuit through a small solenoid which holds the suction valve of the pressure pump off its seat. The solenoid operates against a small force only, as it does not lift the valve but merely keeps it off its seat during one or more cycles. A hand-operated high-pressure pump is provided for pumping up pressure prior to starting, so as to cut down the cranking period. A spring-loaded safety valve is provided on the high-pressure fuel line and is set to release at 5000 lb. per sq. in., and in addition there is a small safety diaphragm on the line, which ruptures at between 7000 and 8000-lb. pressure.



BRAKE HORSEPOWER: *With a compression ratio of 4.03 to 1, the engine develops a maximum brake horsepower of 124 at 2125 r.p.m. With the installation of pistons which give a compression ratio of 5.48 to 1, the engine develops 149 brake horsepower at 2300 r.p.m.—without any other changes in construction or adjustments with the exception of spark advance, which was set for maximum power in each case.*

HIGH

TORQUE: *By raising the compression ratio from 4.03 to 1 to 5.48 to 1, an increase in torque is effected . . . ranging from 8% at 700 r.p.m. to 24% at 2400 r.p.m. This increase in compression ratio was accomplished by installing alternate pistons furnished by the manufacturer.*



RESULTS OF ECONOMY TESTS ON THREE BUSES OF HIGH AND LOW COMPRESSION

FROM a large fleet operation, three average buses were selected. Accurate mileage and cost figures for over 10,000 miles of normal operation were compiled. The compression ratios were then raised from approximately 4.75 to 1 to approximately 5.5 to 1. They were then run—each in excess of 10,000 miles—on Ethyl Gasoline. Buses A and B were overhauled during the test, giving them periods of approximately 5000 miles before and 5000 miles after regular reconditioning. Bus C had been overhauled at 3000 miles before the test started and continued throughout without inspection. Mileage results follow:

Bus	Mi. per Gallon Test Average Gas	Mi. per Gallon Previous Average Gas	Increases Gas	% Increase Gas
A	5.52	4.46	1.06	23.8
B	5.68	4.41	1.27	26.5
C	5.35	4.25	1.10	25.8

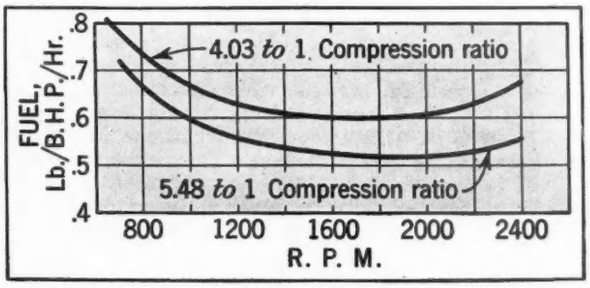
On mileage gains alone, each of the three buses justified the expenditure of the added cost per gallon of Ethyl Gasoline. IN ADDITION there resulted a saving of 32% average decrease in oil consumption, lessened engine wear-and-tear, etc. AND better performance, better time, larger pay load—all from a change that in itself showed a SAVING.

This specific proof is not unusual. The general improvement curves shown above for horsepower and torque were made on a typical engine that was showing fuel economy (as given in the chart below) at the same time.

In a nutshell:

High Compression *plus* Ethyl Gasoline gives more — costs less!

FUEL ECONOMY: *Shown in pounds of fuel used per brake-horsepower hour for the two compression ratios of the same engine represented in the torque and brake horsepower curves shown above.*



COMPRESSION

wins double victory in the

HEAVY-DUTY FIELD

1 It improves performance
(see curves at left, above)

2 It LOWERS operating cost
(see figures at left, below)

NEVER BEFORE has the case for high compression —in any type of engine—been proved with such irrefutable simplicity. Manufacturers and operators of heavy-duty truck and bus engines now have these facts before them—and no conflicting or modifying evidence to lessen the pointed conclusion.

1. Engines of high compression cost no more to build.

2. They produce better performing vehicles.

AND—using Ethyl Gasoline—they cost less per mile to operate than duplicate vehicles with identical engines (except for compression ratio) using a satisfactory motor fuel, purchased at the price of regular gasoline.

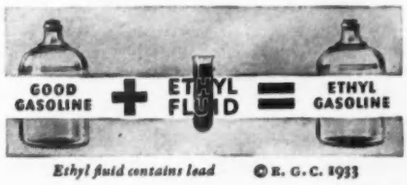
High compression engines not only justify the added cost per gallon of Ethyl Gasoline; they offer the large fleet operator a reward of hundreds of dollars a year *saved* IN ADDITION to improved performance.

Added horsepower (without added engine weight) means more tons pay load, faster schedules, and greater customer satisfaction—whether the fleet is hauling commuters or concrete. And a saving is a saving whether it's made on one unit or multiplied by 5000 units.

The opportunity is ripe today for some heavy-duty engine manufacturer to go beyond the passive *listing* of high compression equipment. Here is a *selling* theme that talks dollars and cents *plus* performance. Here is a tangible *reason* for replacing aged equipment, improving "satisfactory" equipment, and buying new equipment.

All you have to do to *miss* this opportunity is to wait "until there is a more general demand for high compression." In the parade of progress the drum major names the tunes, and those who follow are forced to keep step.

Are there other members of your organization to whom you would like this message sent? Would you like to have further data on heavy-duty tests of high compression? Engineers of the Ethyl Gasoline Corporation will be glad to lend their aid and experience on request. Write Ethyl Gasoline Corporation, Chrysler Building, New York City.



Ethyl fluid contains lead © E. G. C. 1933

SKF
BEARINGS FOR PERFORMANCE

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BROS. & CO.
ROCKFORD, ILLINOIS, U.S.A.
MULTIPLE SPINDLE DRILLING AND TAPPING MACHINES.
AUTOMATIC SCREW MACHINES. SPECIAL MACHINERY

THE ELECTRIC FURNACE CO.
SALEM, OHIO
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ELECTRIC AND FUEL FIRED FURNACES

DIAMOND Vulcanized Fibre
Sheets, rods, tubes, washers and special shapes, to meet every insulating need
Also CELORON Timing Gears and DILECTO.
CONTINENTAL-DIAMOND FIBRE CO.
Newark, Delaware

CRANKSHAFTS
and
Heavy Drop Forgings
THE PARK DROP FORGE CO.
CLEVELAND, OHIO

CHAMBERSBURG-NATIONAL
COMPLETE FORGING EQUIPMENT
CHAMBERSBURG ENGINEERING CO.
CHAMBERSBURG, PA.
THE NATIONAL MACHINERY CO.
TIFFIN, OHIO
Sales Offices
NEW YORK, 152 W. 42nd St. CHICAGO, 565 W. Washington St.
DETROIT, 2457 Woodward Ave.

BUYERS' GUIDE

Automotive Products and Factory Equipment Manufactured by Advertisers in This Issue

See Alphabetical List of Advertisers on Page 43

This Advertiser's Index is published as a convenience, and not as part of the advertising contract. Every care will be taken to index correctly. No allowance will be made for errors or failure to insert.

Arms & Knuckles, Steering
Atlas Drop Forge Co.

Axles
Atlas Drop Forge Co.
Park Drop Forge Co.

Bearings, Anti-Friction
Ball
S K F Industries, Inc.
Roller
Hyatt Roller Bearing Co.
S K F Industries, Inc.
Thrust
S K F Industries, Inc.

Bending & Straightening Machines
Chambersburg Engineering Co.
Chambersburg-National Co.
National Machinery Co.

Blanks
Forged
Atlas Drop Forge Co.

Boring Machines
Baker Brothers, Inc.
Foote-Burt Co.

Brake Testers
Bendix Aviation Corp.

Brakes
Mechanical
Bendix Brake Co.
Eclipse Machine Co.
Stewart-Warner Corp.
Power
Bendix Aviation Corp.
Stewart-Warner Corp.

Bumpers
Stewart-Warner Corp.

Bushings
Fibre
Continental-Diamond Fibre Co.

Camshafts
Atlas Drop Forge Co.

Carburetors
Bendix Aviation Corp.

Channels for Glass
Felt
American Felt Co.

Cleaners
Metal
American Chemical Paint Co. (Rust Preventive)

Connecting Rods
Atlas Drop Forge Co.

Crankshafts
Atlas Drop Forge Co.
Park Drop Forge Co.

Cutters
Baker Brothers, Inc. (Keyseating)
Fellows Gear Shaper Co. (Gear)

Dashes, Truck
Stolper Steel Products Corp.

Drilling Machines
Baker Brothers, Inc.
Foote-Burt Co.
Greenlee Brothers and Co. (Multiple Spindle)

Enamels
American Chemical Paint Co. (Rust Proofing)

Felt
American Felt Co.

Fenders
Stolper Steel Products Corp.

Fibre Rods, Sheets, Tubes
Continental-Diamond Fibre Co.

Forgings
Atlas Drop Forge Co.
Park Drop Forge Co.

Furnaces Electric
(Annealing, Carburizing, Heat Treating, Forging & Welding)
Electric Furnace Co.

Gaskets
Felt
American Felt Co.

Gasoline
Ethyl Gasoline Corp.

Gear Cutting Machines
Fellows Gear Shaper Co. (Shapers)

Gear Material
Non-Metallic
Continental-Diamond Fibre Co.

Gears, Timing
Non-Metallic
Continental-Diamond Fibre Co.

Grinding Machines
Fellows Gear Shaper Co.

Hammers, Power
Chambersburg Engineering Co.
Chambersburg-National Co.
National Machinery Co.

Hangers, Shafting
S K F Industries, Inc.

Heat Treating
Barnes-Gibson-Raymond, Inc.
Barnes, Wallace Co.
Gibson, Wm. D., Co.

Heaters, Car
Stewart-Warner Corp.

Hoods
Stolper Steel Products Corp.

Hose, Flexible Metallic (Radiator & Fuel Lines)
Titeflex Metal Hose Co.

Insulating Material
Continental-Diamond Fibre Co.

Keyseaters
Baker Brothers, Inc.

Lapping Machines
Fellows Gear Shaper Co.

(*Turn to page* 42, *please*)

IS IT NEW?... *but above all* IS IT IMPORTANT?

These are the twin standards by which articles appearing in *Automotive Industries* are selected. The importance of the men who read the publication makes such selection of paramount interest to them. The readers of *Automotive Industries* are key men in automotive plants; men who control purchasing power. They favor an automotive publication which is terse, accurate, dependable. *Automotive Industries* meets the needs of such men in hundreds of automotive manufacturing plants in the United States and in more than a score of foreign countries.

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Thirty-fourth year

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Cable address: "Autoland"

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A complete line including gear or hydraulic feed, single or multiple spindle; vertical, horizontal and way type.
BAKER BROTHERS, INC. TOLEDO, OHIO

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WORCESTER STAMPED METAL · QUALITY STAMPINGS
Heavy, medium and light stampings in any quantity. A steady flow of production—*when* you want it.
WORCESTER STAMPED METAL CO. Worcester, Mass.

FELT
AMERICAN FELT CO.
NEW YORK DETROIT CHICAGO

DEOXIDINE— Prepares Auto Bodies for Painting
RODINE— Pickle Bath Control
STRIPPLE High Speed Enamel Remover
PEROLINE— Rust Preventing Oil
KEMICK— Manifold Paint
FLOSOL— Soldering Flux
PARADOX— Rust Proofing Enamel
AMERICAN CHEMICAL PAINT CO.
AMBLER, PENNA.

TANKS : HOODS : FENDERS
Years of experience in the production of both stamped and fabricated automotive products, to specifications, enable us to meet the most fluctuating production schedules unerringly. We will gladly submit estimates on request.
Stolper Steel Products Corp.
3310 Fond du Lac Ave.
Milwaukee, Wis.

BUYERS' GUIDE—Continued

(*Continued from page* 40)

Lathes
Automatic Chucking
Potter & Johnston Machine Co.
Turret
Potter & Johnston Machine Co.

Molded or Machined Parts (Phenolic)
Continental-Diamond Fibre Co.

Pads
Felt
American Felt Co.

Paints
American Chemical Paint Co. (Heat Resisting)

Pickling Compounds
American Chemical Paint Co.

Plugs, Expansion
Hubbard Spring Co., M. D.

Presses
Chambersburg Engineering Co.
Chambersburg-National Co.
National Machinery Co.

Removers, Enamel & Paint
American Chemical Paint Co.

Rust Removers & Preventives
American Chemical Paint Co.

Screw Machine Products
Barnes, Wallace Co.

Screw Machines
Greenlee Brothers & Co.
Potter & Johnston Machine Co.

Shock Absorbers
Stewart-Warner Corp.
John Warren Watson Co.

Special Machinery
Baker Brothers, Inc.
Greenlee Brothers & Co.

Speedometers & Tachometers
Stewart-Warner Corp.

Springs
Extension, Compression Torsion or Flat
Barnes-Gibson-Raymond, Inc.
Barnes, Wallace Co.
Cook Spring Div.
Gibson, Wm. D., Co.
Hubbard Spring Co., M. D.
Mather Spring Co.
Raymond Mfg. Co.
Leaf
Mather Spring Co.

Stampings or Drawings, Metal
Barnes-Gibson-Raymond, Inc.
Barnes, Wallace Co.
Cook Spring Div.
Gibson, Wm. D., Co.
Hubbard Spring Co., M. D.
Raymond Mfg. Co.
Stolper Steel Products Corp.
Worcester Stamped Metal Co.

Starter Drives
Bendix Brake Co.
Eclipse Machine Co.

Steam Cooling
Rushmore Laboratory

Steel
Alloy
Illinois Steel Co.
Republic Steel Corp.
Bars
Illinois Steel Co.
Republic Steel Corp.
Billets
Illinois Steel Co.
Carbon
Illinois Steel Co.
Republic Steel Corp.
Cold Drawn
Republic Steel Corp.
Electric Furnace
Illinois Steel Co.
Shapes
Illinois Steel Co.
Spring
Barnes-Gibson-Raymond, Inc.
Barnes, Wallace Co.
Gibson, Wm. D., Co.
Stainless
Illinois Steel Co.
Republic Steel Corp.
Strip
Illinois Steel Co.
Republic Steel Corp.

Tank Support Straps
Stolper Steel Products Corp.

Tanks
Stolper Steel Products Corp.

Trapping Machines
Baker Brothers, Inc.
Foote-Burt Co.
Greenlee Brothers & Co.

Thread Generators
Fellows Gear Shaper Co.

Tubing
Flexible Metal
Titeflex Metal Hose Co.

Turret Machines, Automatic
Potter & Johnston Machine Co.

Vacuum Tanks
Stewart-Warner Corp.

Washers
Felt
American Felt Co.
Lock
Shakeproof Lock Washer Mfg. Co.
Plain Metal
Hubbard Spring Co., M. D.

Wicks
Felt
American Felt Co.

Window Regulators
Ackerman-Blaesser-Fezzey, Inc.

Windshield Wipers
Stewart-Warner Corp.

Wire
Flat, Round, Square or Special Shape
Barnes, Wallace Co.
Spring
Barnes, Wallace Co.
Republic Steel Corp.

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EXPANSION PLUGS

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PHOSPHOR BRONZE SPRINGS A SPECIALTY
SMALL STAMPINGS
WASHERS and SPRING COTTERS
WIRE SHAPES

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Rushmore Laboratory

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POTTER & JOHNSTON MACH. CO.
PAWTUCKET, R. I., U. S. A.

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BIG SECTION

on

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In

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